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FILE COPY

August 19, 1992

David Croxton
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Mail Stop HW-106
Seattle, Washington 98101

Subject: Preliminary Assessment Report
Burlington Environmental Inc./Pier 91 Facility
Work Assignment Number R10077
Contract 068-W9-0009
Technical Enforcement Support, Zone 4

Dear Mr. Croxton:

PRC Environmental Management, Inc. is pleased to submit the preliminary assessment report for Burlington Environmental Inc./Pier 91 RCRA facility assessment. Please call me when you have had a chance to review the report so that we can discuss our strategy for the visual site inspection.

If you have any questions please contact me at 624-2692.

Sincerely,

Gwen A. Herron

Gwen A. Herron
Project Manager

Enclosure

cc: Vicky Tapang, EPA RPO (letter only)

9622

file

PRELIMINARY ASSESSMENT REPORT

BURLINGTON ENVIRONMENTAL/PIER 91
SEATTLE, WASHINGTON
WAD 00081 2917

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Waste Programs Enforcement
Washington, D.C. 20460

Work Assignment No.	:	R10077
EPA Region	:	10
Date Prepared	:	August 19, 1992
Contract No.	:	068-W9-0009
Site	:	Pier 91
Prepared by	:	PRC Environmental Management, Inc.
Project Manager	:	Gwen Herron
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EPA Work Assignment	:	
Manager	:	David Croxton
Telephone No.	:	206/553-8582

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1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC) received work assignment 12R10077 from the U.S. Environmental Protection Agency (EPA) under contract 68-W9-0009 to support EPA enforcement of the Resource Conservation and Recovery Act (RCRA). This work assignment is to conduct a RCRA facility assessment (RFA) at Pier 91 facility located in Seattle, Washington to complement the draft RFA (Tetra Tech) conducted at the Chemical Processors, Inc. (Chempro)/Burlington Environmental, Inc. (Burlington) facility in 1988. The 1988 RFA was conducted because Chempro had applied for a RCRA permit. The corrective action requirements for a permit specify that EPA assess all contiguous property under the same owner. Therefore, an RFA is required for all of Pier 91 not just the Chempro portion. EPA has tasked PRC to conduct an RFA at the remaining portions of Pier 91 not assessed during the Tetra Tech RFA and incorporate the Tetra Tech RFA information into a new RFA report. This report presents the findings of the preliminary file review conducted to summarize existing information, identify information gaps, and provide direction for the visual site inspection (VSI).

An RFA usually consists of three steps: a preliminary review, a VSI, and if needed, a sampling visit. The purpose of these steps is to compile and evaluate available information on the facility as follows:

- Identify and gather information on releases of hazardous wastes and constituents at the RCRA facility
- Identify solid waste management units (SWMU) and areas of concern (AOC) at the facility and evaluate them for releases of hazardous wastes
- Screen from further investigation those SWMUs that do not pose a threat to human health or the environment
- Determine the need for additional investigations, such as a sampling visit, and interim measures at the facility

The information presented in this preliminary assessment report is based on a review of information obtained from files at EPA Region 10, Seattle, Washington, and Washington Department of Ecology (Ecology), Bellevue, Washington. Information was also obtained from the Port of Seattle in response to an information request from EPA. Because a draft RFA had already been completed on the Chempro facility, PRC did not conduct a file review on this facility. At the request of the EPA work assignment manager, PRC just incorporated information on Chempro/Burlington from the following documents:

- *Draft Report RCRA Facility Assessment, Chemical Processors, Inc., Pier 91, Seattle, Washington*, April 28, 1988
- *Solid Waste Management Unit Report, Chemical Processors, Inc., Pier 91 Facility*, July 5, 1988.
- Burlington response to EPA SWMU information request, January 24, 1992

The data gaps identified in this report will serve as the basis for the VSI agenda. Following the VSI, all information will be integrated into the draft RFA report.

2.0 FACILITY DESCRIPTION

This section describes the facility location, past and present operations and hazardous waste management practices, and regulatory history of Pier 91.

2.1 FACILITY LOCATION

The Port of Seattle's Pier 91 property is approximately 124 acres in total size and includes Terminals 90 and 91. Pier 91, also referred to as Terminal 91 in the files, is located at the north end of Elliott Bay, 2001 West Garfield, west of 15th Avenue in the interbay area of Seattle between Queen Anne and Magnolia. The general site location is shown on Figure 1.

2.2 SITE HISTORY

Port of Seattle leases portions of Pier 91 to Burlington, Pacific Northern Oil Company (PANOCO), and City Ice and Cold Storage Company. Burlington leases approximately 4 acres of land from the Port of Seattle, on which it operates a hazardous waste storage and treatment facility. This facility has operated under interim status since 1980. Burlington's operations consist of transporting, storing, and treating hazardous waste from off-site generators. Hazardous waste disposal does not occur at this facility. Previously, the Burlington facility had been leased and operated by Chempro (WAD 00081 2917). Chempro occupied the site from 1971 until the fall of 1991. Chempro operated a waste oil treatment and recovery complex.

Information regarding past practice history and releases to the environment for Chempro/ Burlington, PANOCO, and City Ice and Cold Storage Company facilities is summarized in

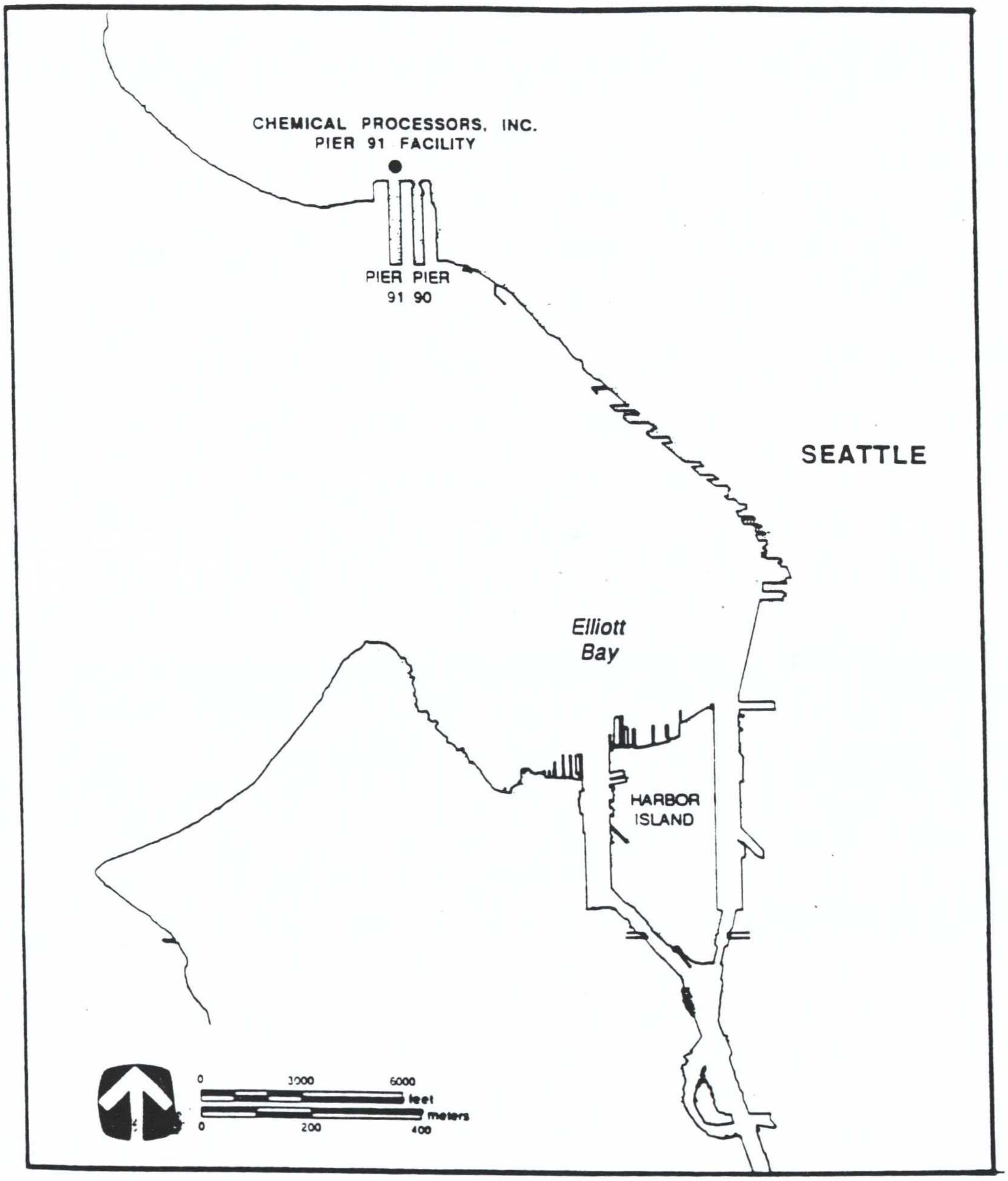


FIGURE 1

GENERAL SITE LOCATION
PIER 91
SEATTLE, WASHINGTON

PRC Environmental Management, Inc.

Source: Tetra Tech 1988 (Appendix A)

sections 2.2.1 though 2.2.3. Section 2.2.4 provides information on locations at Pier 91 not specifically identified at the above facilities.

2.2.1 Chemical Processors, Inc./Burlington Environmental, Inc. Facility

The 4-acre facility was originally owned and operated by Texaco, Inc. in the 1920s. Texaco transferred ownership to the U.S. Navy during World War II, and the city of Seattle operated the facility (Tetra Tech 1988). The U.S. Navy later transferred ownership to the city. In 1971, the city of Seattle leased the 4-acre facility to Chempro. In turn, Chempro subleases approximately 60 percent of the Pier 91 treatment and storage complex to PANOCO for use as a marine fuel depot. All of the oil treated and recovered by Chempro was sold to PANOCO (Tetra Tech 1988). Burlington assumed operation of the Chempro facility in the fall of 1991.

The waste types treated by Chempro included the following (Tetra Tech 1988):

- Dirty oily bilge water
- Pretreated oily wastes from other Chempro facilities
- Oily industrial wastewater
- Spent industrial coolants (phenolic and non-phenolic)
- Waste machine oil from local automotive shops

Chempro generated hazardous waste sludges from thermal, chemical, and physical treatment of waste oil and oily wastewater. The sludges potentially contain significant concentrations of extraction procedure toxicity constituents (e.g., lead and chromium) and volatile organic compounds associated with petroleum products (Tetra Tech 1988). The waste sludge was transferred to the Lucille Street Chempro facility and eventually disposed of at the Chem Security Systems, Inc. landfill in Arlington, Oregon (Tetra Tech 1988).

On July 2, 1974 Port of Seattle investigators toured the Chempro tank farm and pumphouse area and observed that ground surrounding some of the tanks was saturated with oily sludge. The pipe alley had been flooded, and oily residue was observed on site. During this tour, stairs and walkways were found slippery from the spilled oil. Trucks were allowed to dump oil on the ground outside the tank farm wells. Oil had seeped out of the tank farm into the storm sewer that led to Elliott Bay (POS 1974).

Soil samples collected from the Chempro facility indicated the presence of organic solvents (toluene, ethylbenzene, and xylene) about 3 to 5 feet below the paved surface (POS 1987a). Toluene, ethylbenzene, and total xylenes were detected at 1,700, 7,800, and 22,000 parts per million (ppm), respectively (POS 1987a). Information on the exact locations of this contamination is not available.

One RCRA-regulated unit and 16 SWMUs were identified for the Chempro Pier 91 facility (Tetra Tech 1988) during the 1988 RFA conducted for this site (Appendix A). The SWMUs are listed in Section 4.0 of this report and their locations are illustrated in Figure 2.

Chempro provided a list of units closed prior to and during the Chempro operations (Chempro 1988). Units that may have been SWMUs prior to Chempro operations are listed below and illustrated in Figure 3 (Chempro 1988):

- Building 17
- Tanks 340 and 341
- Tank 1530
- Tanks 119-126
- Tanks 7 and 8
- Oil barrel drain pit
- Oil barrel tumbler pit

SWMUs closed during the Chempro operation are as follows (Figure 3) (Chempro 1988):

- Tank 118
- Wastewater treatment tanks (2)
- Coolant treatment tank
- Treated wastewater tank

More information on the SWMUs closed prior to and during the Chempro operations is included in Appendix B. No information was found in the files to document releases from these SWMUs prior to the beginning of the Chempro operations in June 1971 (Chempro 1988).

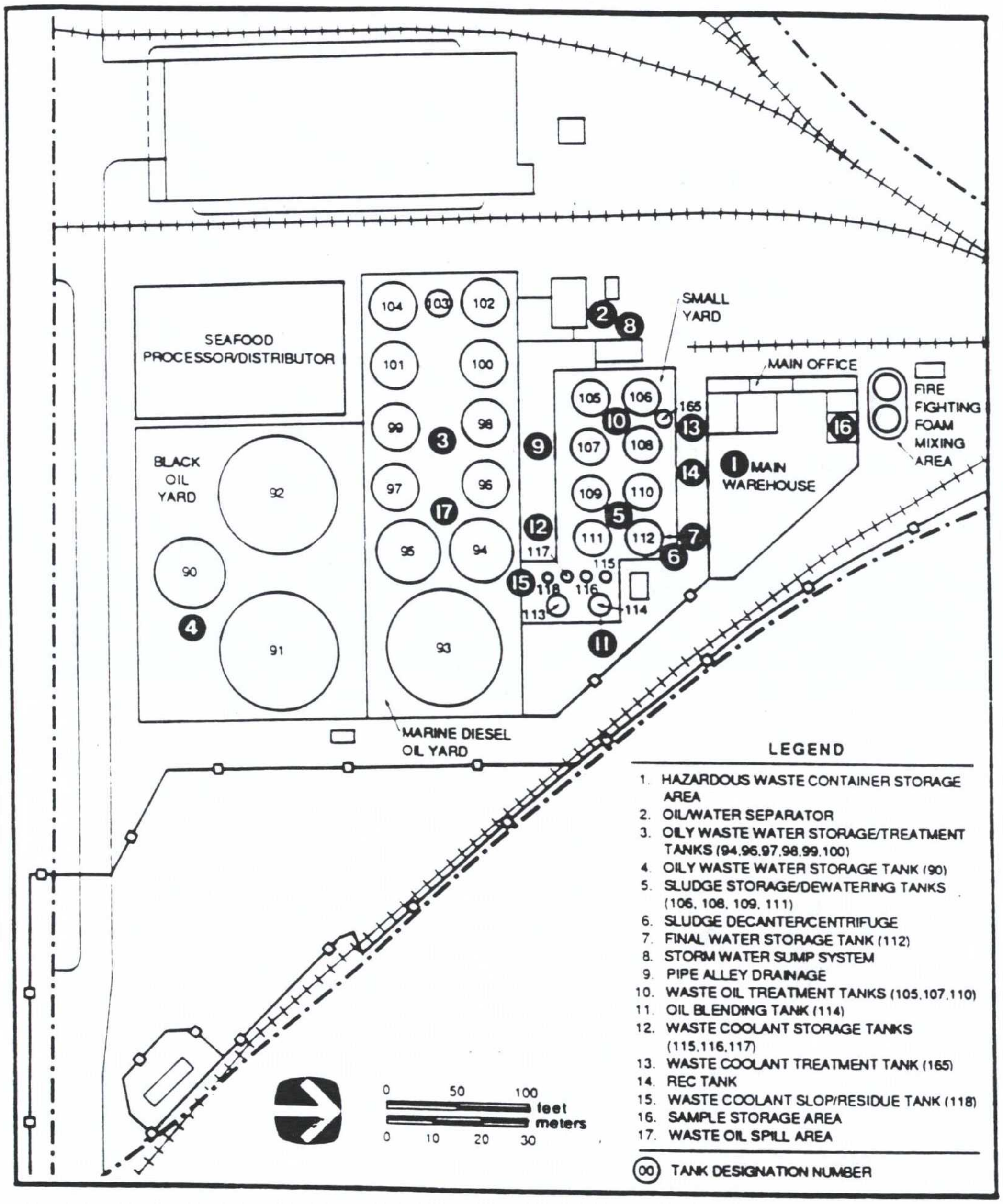


FIGURE 2

MAP OF RCRA-REGULATED AND SOLID WASTE MANAGEMENT UNITS, CHEMPRO PIER 91 FACILITY SEATTLE, WASHINGTON

Source: Tetra Tech 1988 (Appendix A)

PRC Environmental Management, Inc.

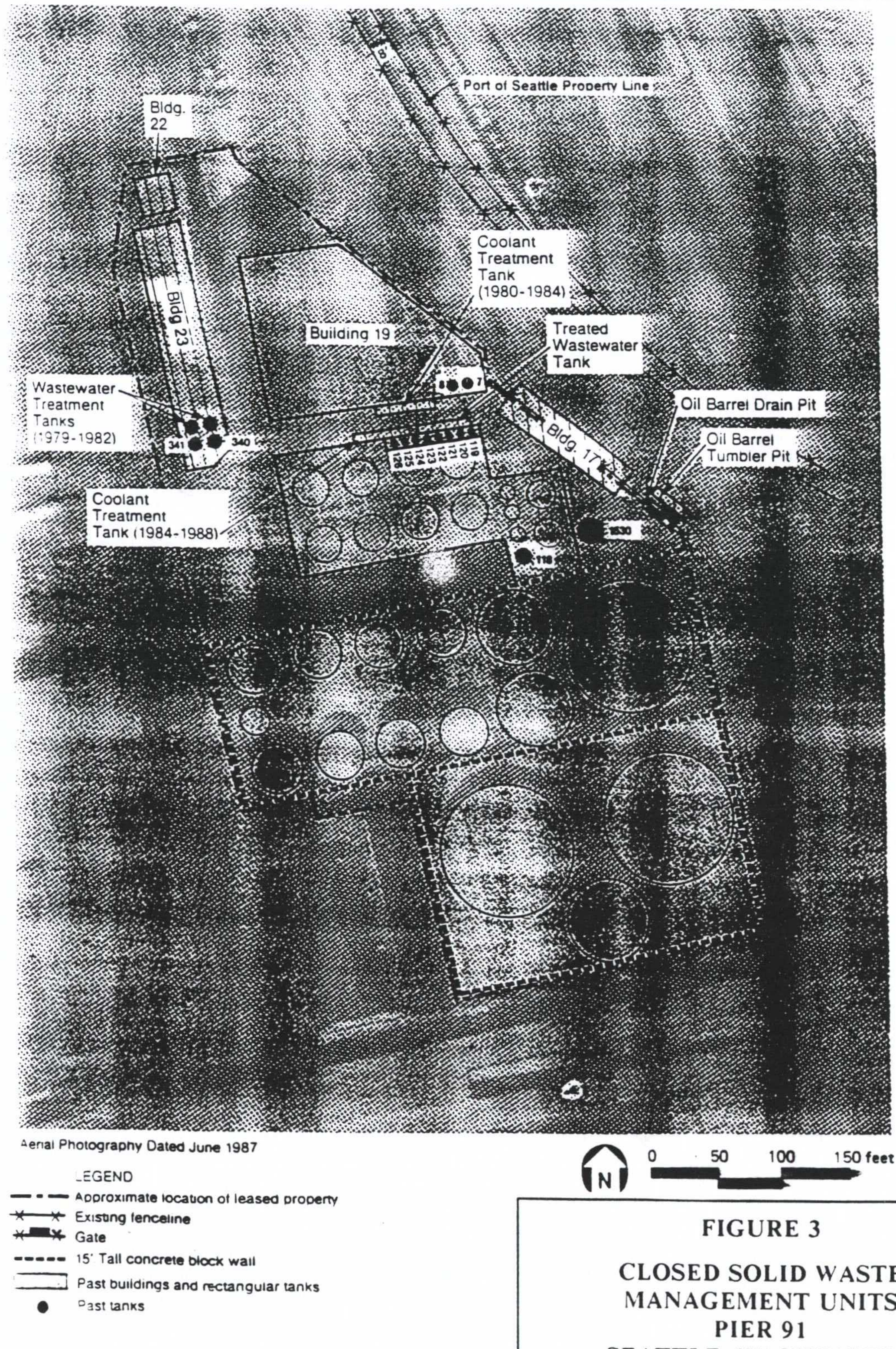


FIGURE 3

CLOSED SOLID WASTE MANAGEMENT UNITS PIER 91 SEATTLE, WASHINGTON

Source: Chempro 1988

PRC Environmental Management, Inc.

Known releases to the environment prior to and during Chempro operations up until July 5, 1988 are included in Appendix C (Chempro 1988). Undocumented possible releases to the environment prior to and during the Chempro operations are included in Appendix D.

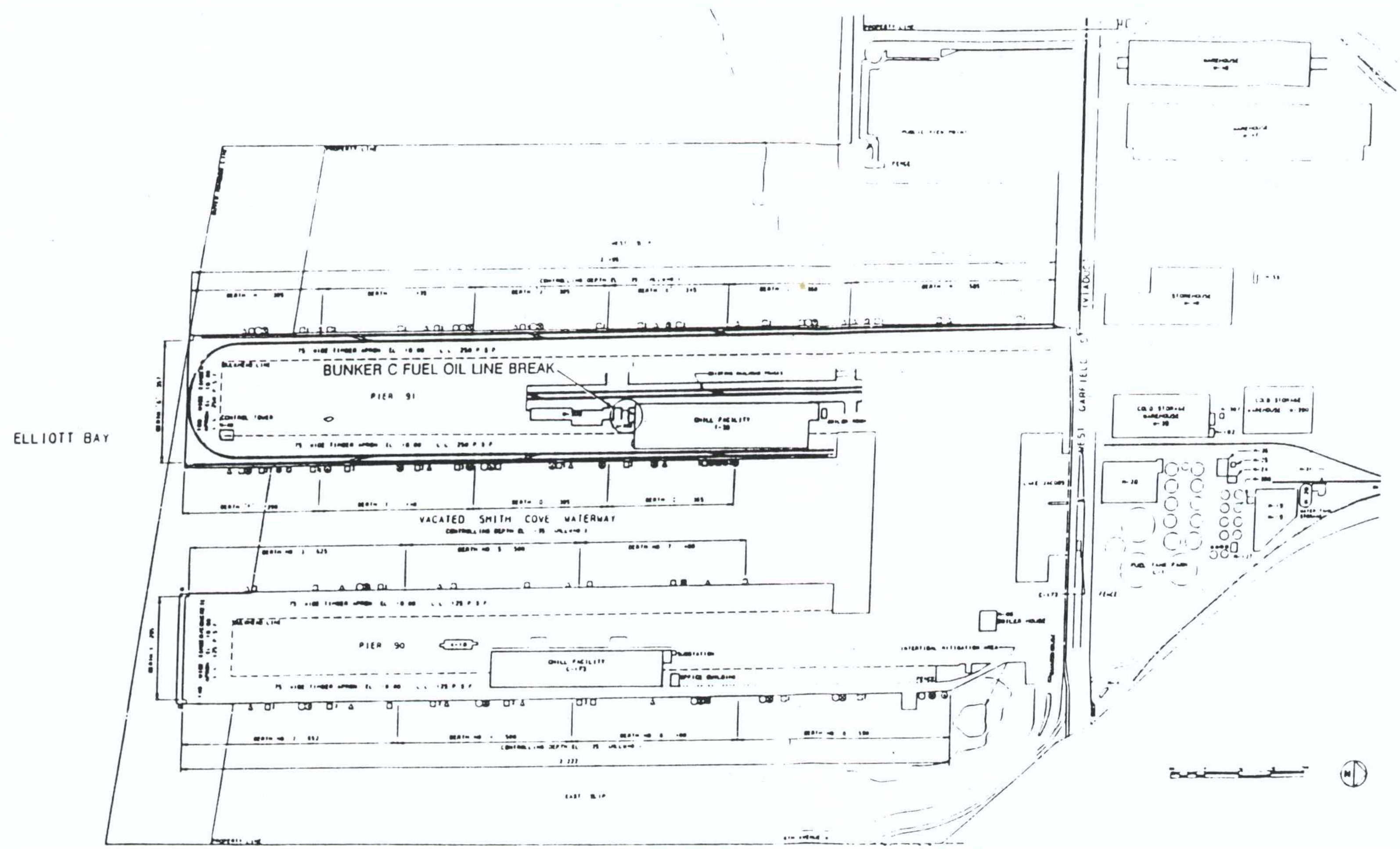
SWMUs closed at the Chempro facility after July 5, 1988 include an oil/water separator used for incoming oily wastewaters and oils to be transferred to the storage/treatment tanks. The oil/water separator had been in operation from 1926 to 1990 (Burlington 1992). This 41,450-gallon unit was used for separation of oily wastewater and oil (exempt for reuse or recycling). This unit consisted of a concrete vault that was removed from service, decontaminated, covered, and secured in February 1992. No information on known releases from this unit to the environment was available (Burlington 1992). This unit has been reported as SWMU 2 in the RFA conducted for the Chempro facility (Tetra Tech 1988).

Another SWMU was closed at the Chempro facility after July 5, 1988. This SWMU consisted of piping used to transfer product as well as dangerous and nondangerous wastes from tank to tank both within and outside of the small yard from 1930 to 1991 (Burlington 1992). This SWMU was approximately 500 feet long and made of 3- to 6-inch piping. The unit was removed from service, decontaminated by flushing, and filled with concrete in March 1991. No information on releases from this unit is available (Burlington 1992). This unit may have been previously reported as SWMU 9 (Section 4.0 of this report) in the 1988 RFA.

2.2.2 Pacific Northern Oil Company Facility

This section provides past practice history and identified releases to the environment at the PANOCO facility. Chempro subleased approximately 60 percent of the Pier 91 treatment and storage complex to PANOCO for use as a marine fuel depot. The Puget Sound Air Pollution Control Agency (PSAPCA) air monitoring inspections conducted at the Chempro Pier 91 facility focused on the emissions from PANOCO's boiler. The PSAPCA inspection records do not specify any emissions originating from Chempro processes (Tetra Tech 1988). However, PSAPCA issued over 10 violations to the Chempro Pier 91 facility since 1976. All of these violations have been the result of PANOCO's boiler stack emissions (Tetra Tech 1988).

On August 26, 1990, PANOCO discovered a rupture in a bunker C transfer line located near the center of Pier 91 (Figure 4). This fuel line was replaced, and approximately 80 cubic yards of contaminated soil was excavated. A small amount of contaminated soil below the valve box (about 1.5 cubic yards) could not be removed because of the potential for structural damage to the valve box and transfer line (Converse 1990). The contaminated soil was transported to an asphalt plant in Tacoma, Washington. Grab samples collected from the excavation side walls and



Source: Converse 1990

FIGURE 4

AUGUST 1990
BUNKER C OIL LINE BREAK
TERMINAL 91
SEATTLE, WASHINGTON

PRC Environmental Management, Inc.

bottom indicated the presence of total petroleum hydrocarbon (TPH) concentrations below the Ecology cleanup standards of 200 ppm (Converse 1990).

Ecology files report another release of approximately 1,300 gallons of petroleum product into the soil from an underground pipe operated by PANOCO (Ecology 1990a). The exact location of this release is not known. No information was contained in the file regarding any cleanup of this release.

On May 14, 1991, PANOCO discovered another rupture in a bunker C transfer line near the south end of Pier 91 (Figure 5). PANOCO estimated a release of approximately 30 to 60 gallons to the underlying soil (Converse 1991). The fuel line was replaced, and approximately 40 to 50 cubic yards of petroleum-contaminated soil were removed (Ecology 1991). Confirmation soil samples were collected from the excavated area. No TPHs were present in the analyzed samples (Converse 1991).

Further, investigation at the Pier 91 facility indicated the presence of floating diesel on the water table in the vicinity of the pipeline operated by PANOCO (Converse 1992). As an immediate response to control the migration of the diesel product and to reclaim the free product, an interim product extractions system was implemented at the PANOCO pipeline site (Converse 1992). The liquid hydrocarbon recovery system intake lines are equipped with floats designated to maintain the intake at the top of the air/liquid hydrocarbon interface. An oil/water separator recovers the liquid hydrocarbons and discharges the groundwater effluent to the municipality of metropolitan Seattle sewer system under permit No. 7597 (Converse 1992). Recovered liquid hydrocarbons are stored on site in 55-gallon drums. The recovery system began operations on January 15, 1991. Since that time and as of February 7, 1992, approximately 47,760 gallons of total fluids have been recovered and treated by the oil/water separator (Converse 1992).

2.2.3 City Ice and Cold Storage Company

Another facility located on Pier 91 is the City Ice and Cold Storage Company. This section presents information on past practice history and identifies releases to the environment for this facility. The construction expansion of the City Ice and Cold Storage warehouse and fish processing facility resulted in a geotechnical investigation of the proposed site. The June 23, 1987 investigation of one of the monitoring wells at the proposed area indicated 900 ppm of hydrocarbon vapors (Geo Engineers 1987). Water samples collected on August 19, 1987 indicated presence of petroleum hydrocarbons, diesel fuel, benzene, and ortho-xylene (Geo Engineers 1987). Port of Seattle records indicate a citation was issued to City Ice and Cold Storage

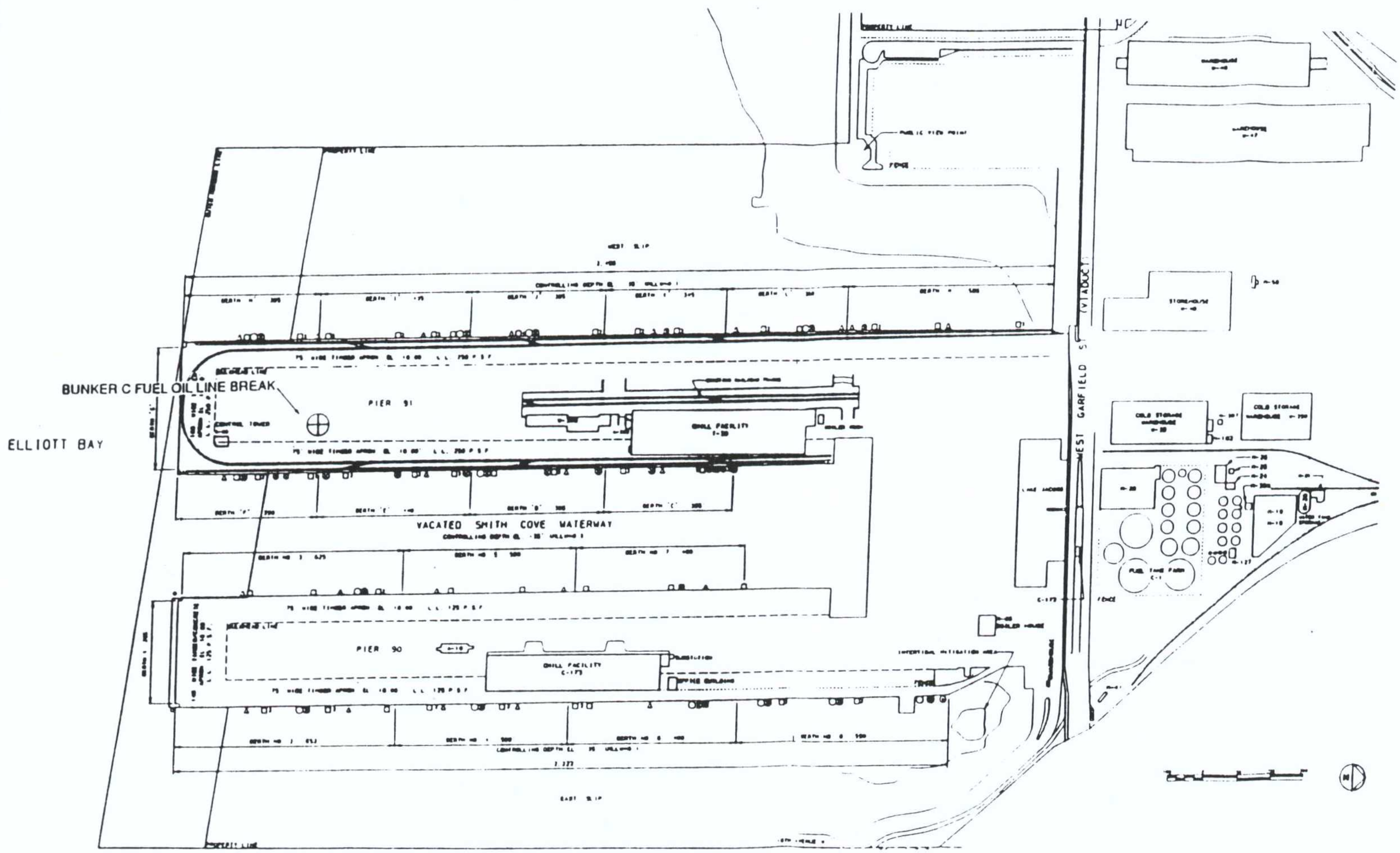


FIGURE 5

MAY 1991
BUNKER C OIL LINE BREAK
TERMINAL 91
SEATTLE, WASHINGTON

Source: Converse 1991

PRC Environmental Management, Inc.

Company for a minor ammonia release and reported oil spill that occurred on July 24, 1987 (POS 1987b). City Ice and Cold Storage Company, in a response letter to Ecology, indicated that no aboveground or underground storage tanks exist at this site (1987). The facility does have an ammonia receiver as part of the refrigeration system. The ammonia spill resulted from repairable failure in a shell and tube condenser (City Ice 1987). No information on the present status of this unit is available. City Ice and Cold Storage Company reports the accumulation of used refrigeration oil in 52-gallon steel drums. This oil is either sold to or collected by a used oil processing company (City Ice 1987).

Hydrocarbon contamination of soils and groundwater in the vicinity of underground storage tank number 91N has been documented during investigations for construction of the new City Ice and Cold Storage Company building (Building W-390). This building is located north of the tank 91N site. The Chempro facility is located east of tank 91N (Figure 6). This tank was removed in December 1989 (HLA 1990). In 1987 free product was observed during excavation for the foundation of the W-390 building north (upgradient) of the site (HLA 1990). Concentrations of diesel fuel in the soils encountered during drilling of MW-39-2 and MW-39-3 greatly exceed Ecology's soil cleanup guidance level of 200 ppm for hydrocarbons in soil (HLA 1990).

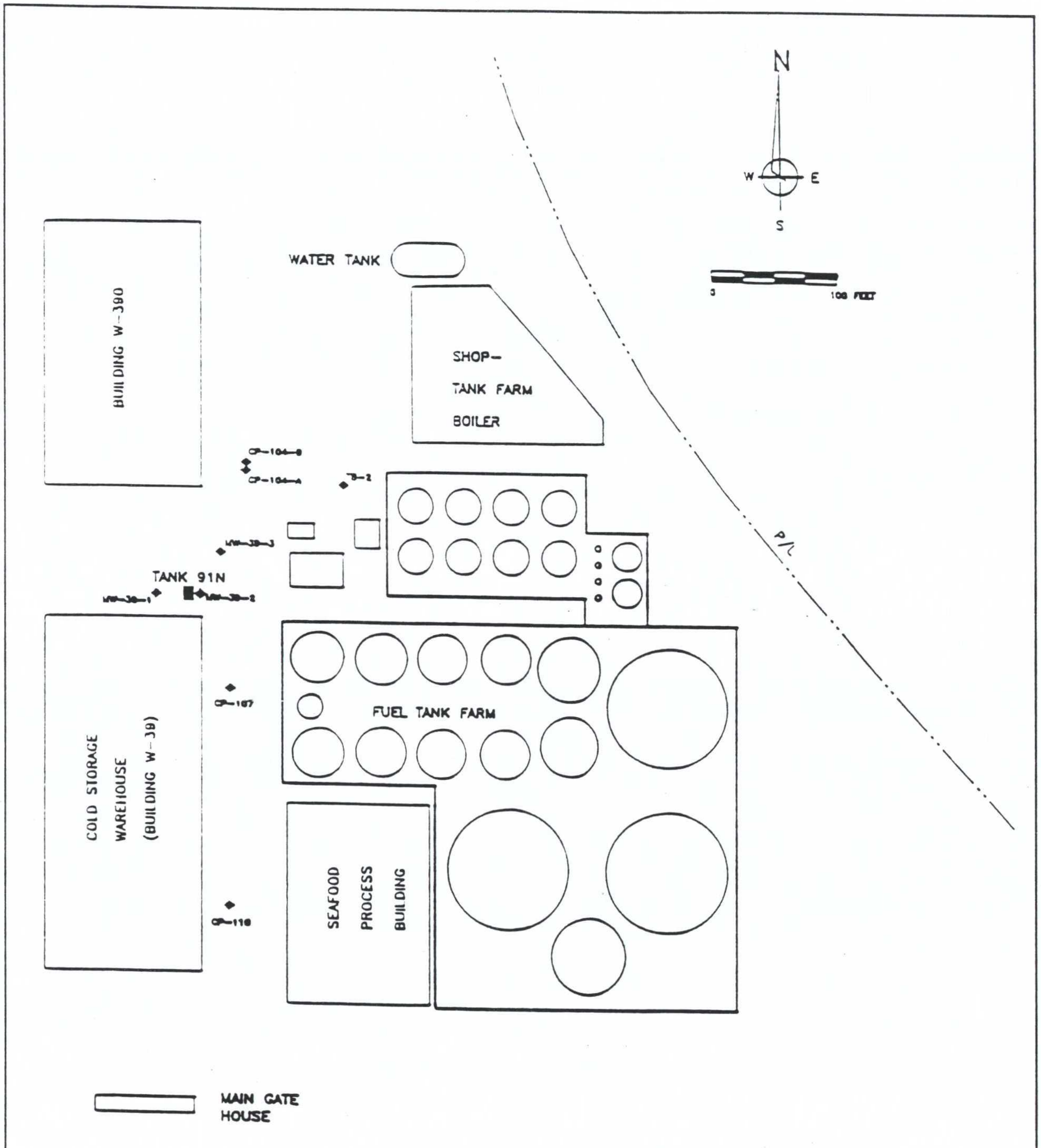
2.2.4 Miscellaneous Site Information

This section provides information obtained from file reviews not relating to the above-mentioned facilities. The exact location of the following units is not identified in the files. Reviews of the Ecology files (Ecology 1990b) revealed the Port of Seattle proposed an action plan involving the removal of five underground storage tanks and replacement with a new 20,000-gallon underground storage tank. Additional information regarding the use of this tank was not available in the files.

The preliminary tank assessment activities at Pier 91 were performed on June 14, 16, 22, and 26, 1990. The Port of Seattle tank designations for the investigated tanks are listed below (ERM 1990):

Tank A - 2,000-gallon gasoline tank
Tank B - 7,000-gallon unleaded gasoline tank
Tank C - 10,000-gallon unleaded gasoline tank
Tank K - 500-gallon heating oil tank

Underground storage tank investigation at Pier 91 indicated soil contamination around tanks A, B, C, and K (ERM 1990). Elevated presence of total extractable petroleum hydrocarbon (TEPH)



MONITORING WELLS AND SOIL BORINGS LOCATIONS

Source: HLA 1990

FIGURE 6

BUILDING W-39 VICINITY MAP
TERMINAL 91
SEATTLE, WASHINGTON

PRC Environmental Management, Inc.

in the soil samples collected at 7.5 and 14 feet below ground surface were observed around tank K. Low levels of TEPH were present in the upper 10 feet of soil around tanks B and C. Elevated concentrations of TEPH, benzene, and xylene above the Model Toxics Control Act limits were detected to a depth of 9 feet around tank A (ERM 1990). Soil excavation and sampling adjacent Pier 91 tanks D, E, F, G, and N in August 1989 indicated soil and groundwater contamination resulting from releases at tanks G and N (ERM 1990).

Underground storage tank investigations were conducted on a 500-gallon capacity tank located adjacent to the north end of building 38 (Figure 7). The tank was installed in 1957 and has not been used since 1979 (SCS 1989). The laboratory results do not indicate the presence of petroleum hydrocarbons above detectable levels in the soil samples collected around the 500-gallon underground storage tank (SCS 1989).

In addition, test results of the swabs taken at Pier 91 concrete transformer slabs following removal of polychlorinated biphenyl (PCB) transformers indicated PCB contamination above the regulatory level of 100 $\mu g/100\ cm^2$ (GE 1986). The exact location of the transformers on site is unclear from file information.

3.0 ENVIRONMENTAL SETTING

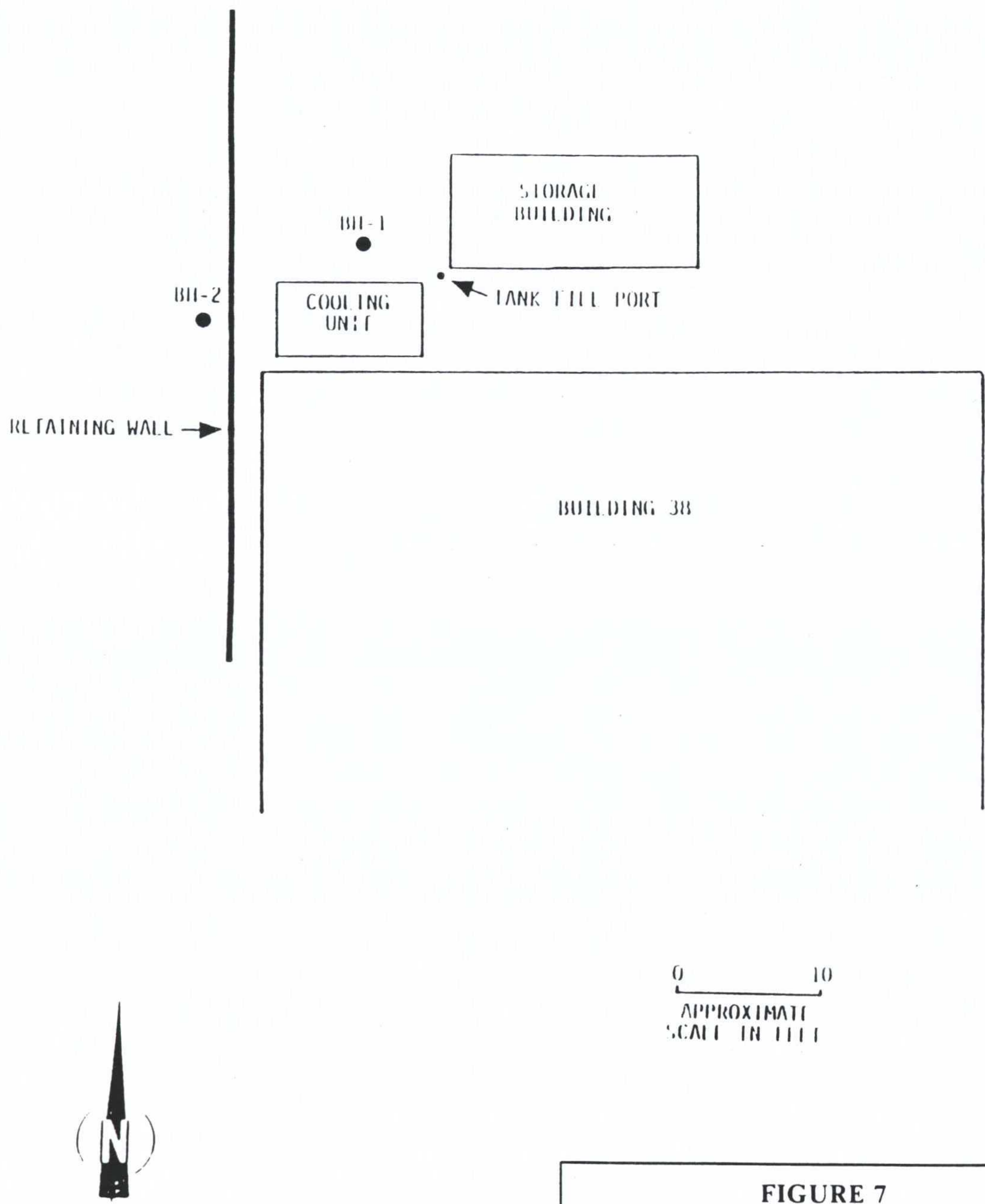
This section discusses the environmental setting surrounding the Pier 91 site. Because of time constraints for completing of this document, the following sections provide limited information on the environmental setting surrounding the facility. Additional information obtained from the VSI or the information request will be included in the draft RFA report.

3.1 METEOROLOGY

The climate surrounding Pier 91 in Seattle, Washington along the northern shore of Elliott Bay is moderate. The average maximum daily temperatures range from 35°F in January to near 70°F in July and August. The annual precipitation is approximately 35 inches. Late autumn and winter are the wettest seasons (Tetra Tech 1988).

3.2 GEOLOGY AND HYDROGEOLOGY

The following information is a quotation from the Tetra Tech (1988) draft RFA report for Chempro, Pier 91.



Source: SCS 1989

FIGURE 7

BUILDING 38 VICINITY MAP
PIER 91
SEATTLE, WASHINGTON

PRC **Environmental Management, Inc.**

The Pier 91 industrial complex is underlain by anthropogenic deposits of unsorted and unstratified material. This material consists of clay, silt, sand, and gravel originating from dredgings from Elliott Bay and regrading activities in King County, Washington. The majority of the pier construction occurred in the early 1900s. The man-made fill material ranges from 0 to approximately 60 feet in thickness and is underlain by quaternary tidal flat deposits of clay, silt, and sand.

The hydrogeology of the Pier 91 area is poorly understood. The fill material is generally poorly sorted. Because of the man-made deposition, well defined stratification of the material into laterally continuous layers is unlikely. The well logs from the nearby monitoring wells indicate a significant amount of sand and gravel overlying the quaternary tidal deposits. The coarse nature of the material probably produces a relatively high permeability. The fill material most likely behaves as a tidally influenced, unconfined aquifer. Further hydrogeologic tests would be necessary to fully characterize the Pier 91 vicinity.

The preliminary groundwater information collected by Chempro suggests that the groundwater flow is to the south-southwest towards Elliott Bay.

3.3 SURFACE WATER

There are no permanent streams or rivers in the immediate vicinity of the Pier 91. The Pier is located adjacent to Elliott Bay (Tetra Tech 1988).

3.4 RECEPTORS

Releases of hazardous constituents from the activities conducted on Pier 91 could affect employees at the facilities on site, aquatic biota, and to a much lesser extent, terrestrial biota. Employees at the facilities located on the pier are subject to exposure of contaminants through direct dermal contact with hazardous constituents and inhalation of hazardous vapors. It is unlikely that these exposure routes would be of concern outside the facility.

Surface water does not drain off site from Chempro to local surface waters (Tetra Tech 1988). It is unknown whether the other areas of the pier discharge to the local surface water, Elliott Bay. Surface water is not used for human consumption, but Elliott Bay is used for recreational purposes (e.g., boating, fishing, and scuba diving). Aquatic fauna would be exposed through ambient contact of contaminated surface water, ingestion of contaminated plants or prey, and respiration through the gills. Aquatic plants would be exposed through ambient contact and the uptake of contaminated sediments and water. Terrestrial fauna may be exposed through ingestion of contaminated surface water.

Soil exposure routes for terrestrial biota include dermal contact and ingestion of contaminated soil, plants, or prey by animals and uptake through the root system and absorption through the leaves for plants. While the above-mentioned scenarios are possible, ecological impacts in industrial areas are difficult to ascertain. The primary receptors of concern at this facility are its employees.

3.5 REGULATORY HISTORY

Although Pier 91 has a single owner, separate and distinct operators run portions of the facility. The following information is a brief regulatory history regarding the various facilities operating on the Pier property. The Port of Seattle received hazardous waste identification number WAD 98098 2706 for generating wastes from the off-site disposal of PCB transformers, fluids, rinsates, as well as miscellaneous rags and cleaning material (POS 1986). Chempro originally notified EPA of its hazardous waste activities in August 1980 and received an identification number (WAD 00081 2917). Chempro submitted a RCRA Part A application for interim status in 1980. The Part A was revised a number of times, most recently in November 1991. In November 1988 Chempro submitted a RCRA Part B application and received a state-authorized permit in July 1992, effective August 26, 1992. The ownership of the Chempro operations were assumed by Burlington in the fall of 1991. PANOCO (WAD 98176 0762) operates only as a generator of ignitable waste. City Ice and Cold Storage Company does not have an EPA identification number.

4.0 SOLID WASTE MANAGEMENT UNITS

SWMUs operated by Chempro/Burlington, PANOCO, and City Ice and Cold Storage Company are discussed in this section.

4.1 CHEMICAL PROCESSORS, INC./BURLINGTON ENVIRONMENTAL, INC. SOLID WASTE MANAGEMENT UNITS

This section describes the SWMUs identified during the preliminary review process for Chempro/Burlington. The 1988 draft RFA for Chempro Pier 91 (Tetra Tech 1988) lists one RCRA-regulated unit and 16 SWMUs (Figure 2).

The RCRA-regulated unit is defined as SWMU 1, the hazardous waste container storage area.

The 16 SWMUs are as follows:

SWMU 2 - Oil/water separator (closed in February 1992)

SWMU 3 - Oily wastewater storage/treatment area

SWMU 4 - Oily wastewater storage/treatment tank 90

SWMU 5 - Sludge dewatering/storage

SWMU 6 - Sludge decanter/centrifuge

SWMU 7 - Final water storage tank

SWMU 8 - Storm water sump system

SWMU 9 - Pipe alley drainage (may have been closed in March 1991)

SWMU 10 - Waste oil treatment tanks

SWMU 11 - Oil blending tank

SWMU 12 - Waste coolant storage tanks

SWMU 13 - Waste coolant treatment tank

SWMU 14 - Rec tank

SWMU 15 - Waste coolant slop/residue tank

SWMU 16 - Sample storage area

SWMU 17 - Waste oil spill area

Description, waste characteristics, migration pathways, evidence of release, and exposure potential information for each unit, as described by Tetra Tech (1988) is included in Appendix A.

Fifteen additional SWMUs have been identified since the draft 1988 Chempro RFA report. These SWMUs are described in the remainder of this section.

Tanks currently operated by Chempro/Burlington include numbers 90, 94, 96, 98, 100, 105, 112, 114-118, 164 and 165. The tanks originally held a variety of wastes; however, during 1988 and 1989 all Burlington tanks were emptied, decontaminated, and inspected for possible certification for RCRA use. Residuals and debris from emptying and decontaminating were managed as Ecology-designated dangerous waste (WT02) (Burlington 1992). Tank descriptions are provided below (Burlington 1992). Further information on these SWMUs regarding the dates, operation, and types of wastes will be included in the draft RFA report.

SWMU 18 - Tanks 90, 96, 98, and 100

Prior to 1988 these tanks were used for storage of nondangerous wastes such as oil/water mixture and oil. Currently the tanks are used for storage of asphalteens (nondangerous waste).

SWMU 19 - Tank 94

Prior to 1988 and during the present Burlington operations, this tank has been used for storage of waste oil (nondangerous waste).

SWMU 20 - Tank 105, 107, and 110

These tanks are used for storage of nondangerous oil/water. Tank 110 is certified for RCRA service.

SWMU 21 - Tank 106

Prior to 1988 this tank was used for dangerous waste sludge dewatering. Currently, nonregulated boiler condensate return water accumulates in this tank.

SWMU 22 - Tank 108

Prior to 1988 this tank was used for dangerous waste sludge dewatering. This unit is currently out of service.

SWMU 23 to 25 - Tank 109, 111, 112

These tanks have been used for dangerous waste oil/water mixture and oil treatment. These tanks are certified for RCRA service. No additional information was available for these tanks.

SWMU 26 - Tank 114

Prior to 1988 this tank was used for treatment of dangerous waste oil/water mixtures and oil. Currently, nondangerous waste emulsified oil is stored in this tank.

9622

SWMU 27 to 30 - Tanks 115-118

Prior to 1988 these tanks were used for storage of unspecified dangerous waste. Currently these tanks are out of service. No additional information is available for these tanks.

SWMU 31 - Tank 164

This tank has been used for storage of dangerous waste and is certified for RCRA service. Additional information on this tank is not available.

SWMU 32 - Tank 165

This tank was used for dangerous waste storage and is currently out of service. Additional information for this tank is not available.

4.2 SOLID WASTE MANAGEMENT UNITS OPERATED BY PACIFIC NORTHERN OIL COMPANY

The following SWMUs and tanks operated by PANOCO have been identified during review of EPA and Ecology files.

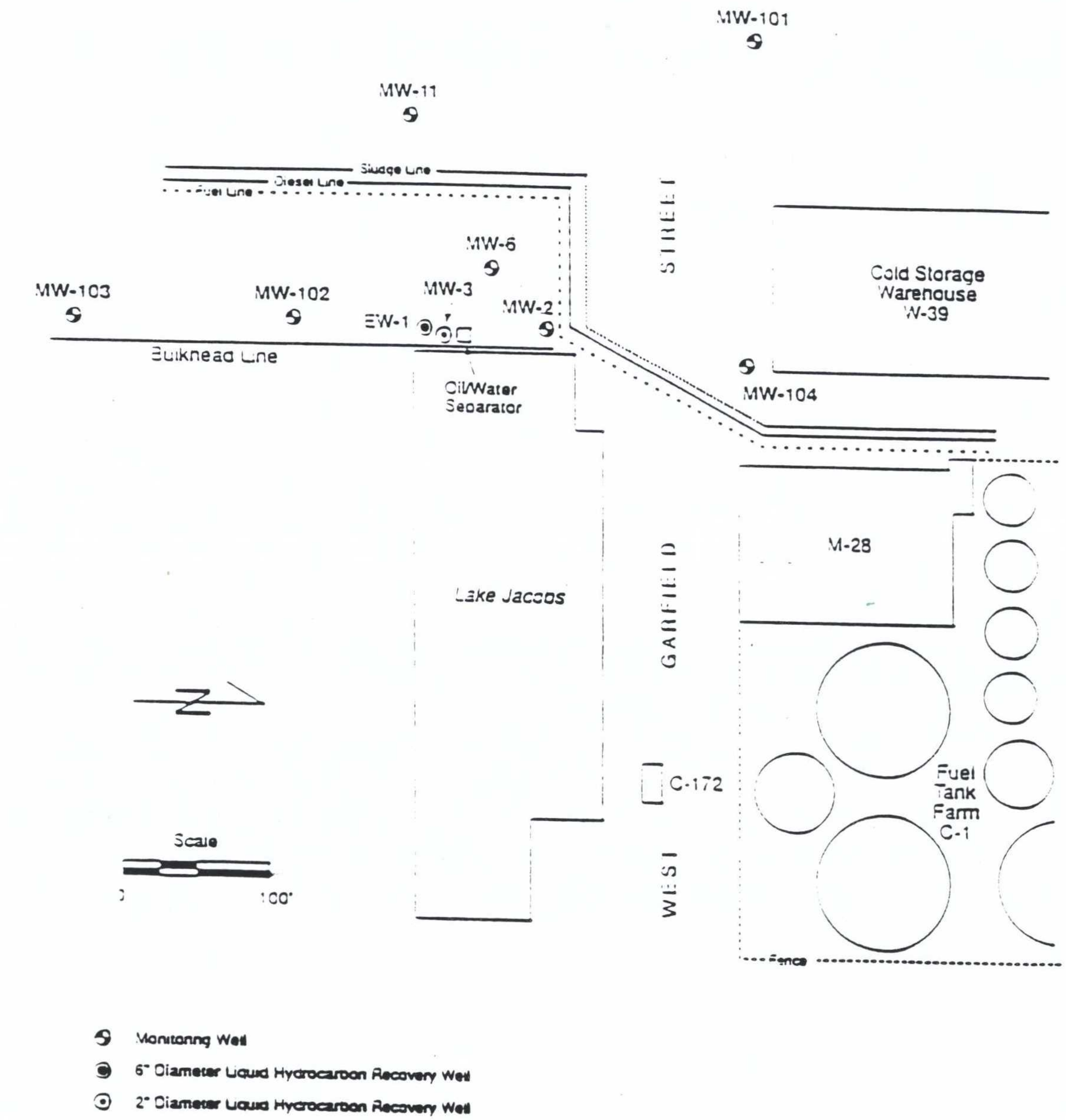
Tanks 91-93, 95, 97, 99, 101-104, and 113 are operated by PANOCO. These tanks are used for storage of product and non-RCRA-regulated dangerous waste-exempt waste oils. The tanks are periodically emptied and cleaned, but they were not inspected for possible certification for RCRA use in 1988 and 1989 along with Burlington tanks (Burlington 1992). The tank descriptions are as follows (Burlington 1992).

SWMU 33 - Liquid Hydrocarbon Recovery System

This liquid hydrocarbon recovery is accomplished with an all-pneumatic system, total fluids pump installed in a 6-inch diameter extraction well (EW-1) and a 2-inch diameter monitoring well (MW-3) (Figure 8) (Converse 1992). Separation of recovered liquid hydrocarbons from water is accomplished with a Quantek coalescing plate oil/water separator (Converse 1992).

SWMU 34 - Oil/Water Separator

The oil/water separator used for PANOCO operation recovers the liquid hydrocarbons and discharges the groundwater effluent to the municipality of metropolitan Seattle sanitary sewer



Source: Converse 1992

FIGURE 8

MONITORING WELL LOCATION MAP PIER 91 SEATTLE, WASHINGTON

PRC Environmental Management, Inc.

system under permit No. 7597 (Converse 1992). The recovered oil is stored on site in 55-gallon drums (Converse 1992).

SWMU 35 - Storage Area for 55-Gallon Drums of Waste Oil

This SWMU is a storage area that holds 55-gallon drums used to store the waste oil generated by the oil/water separator used for PANOCO operations (Converse 1992).

SWMUs 36 and 37 - Tanks 104, 113

These tanks are used for storage of non-RCRA-regulated diesel and boiler fuel. No additional information on the tanks and the stored fuel was available.

SWMUs 38 to 46 - Tanks 91-93, 95, 97, 99, 101-103

These tanks are used for storage of blended nondangerous waste oils and lubricant until the oil is marketed as marine boiler fuel and marine diesel.

4.3 SOLID WASTE MANAGEMENT UNITS OPERATED BY CITY ICE AND COLD STORAGE COMPANY

This section lists City Ice and Cold Storage Company SWMUs identified during the file review.

SWMU 47 - Ammonia Receiver

This unit is part of the operating refrigeration system located in the City Ice and Cold Storage Company (City Ice 1987). No additional information on this unit is available.

SWMU 48 - Used Oil Storage Drum Area

A 52-gallon steel drum is used to accumulate used refrigeration oil at the City Ice and Cold Storage Company (City Ice 1987). This oil is either sold to or collected by a used oil processing company (City Ice 1987).

Additional information on the above-mentioned SWMUs will be collected during the VSI. Portions of the Pier 91 not operated by the above-mentioned facilities will be investigated during the VSI. Any additional SWMUs identified during the VSI will be documented. Information collected during the VSI will be reported in the draft RFA.

5.0 AREAS OF CONCERN

This section discusses the AOCs identified during the file review. These areas may consist of one-time spills or areas of potential SWMUs. The descriptions and information included in these sections are brief because of time constraints for this preliminary report. Additional information gathered will be included in the draft RFA.

5.1 AOC 1 - AMMONIA SPILL AT CITY ICE AND COLD STORAGE FACILITY

Ammonia leaked because of equipment failure. A mixture of water and ammonia was discharged into the water below the pier. It is unclear from the file information whether any kind of recovery action was taken. The amount of ammonia released is also unclear.

5.2 AOC 2 - DIESEL SPILL

This spill is located south of the guard shack at the West Garfield Street entrance and west of the retaining wall and Lake Jacobs. The results of investigations in 1989 and 1990 indicate of the presence of floating diesel hydrocarbons on the water table in the vicinity of the pipeline. The pier is using an interim product extraction system as an immediate response to control the migration of the diesel protect and reclaim free product.

5.3 AOC 3 - WASTE OIL SPILL AT CHEMPRO

An estimated 420,000 gallons of waste oil was released onto the unpaved ground in the Marin Diesel Oil Yard of Chempro. The release occurred before the yard was paved in 1986, but the exact date is unspecified in the report. Cleanup efforts apparently removed several cubic yards of soil. However, there are no records indicating that investigations were performed to determine whether the remedial activities were successful in removing all contaminated soil. The presence of contamination in downgradient wells suggest that contaminants from the yard have entered the aquifer (Tetra Tech 1988)

5.4 AOC 4 - PCB TRANSFORMER PADS

Two swabs were taken at Pier 91 in 1986 when PCB transformers used on site were removed. The location of the transformers and the concrete pad cannot be determined from the information in the file. One swab was a background sample, and both swabs indicated PCB contamination levels higher than 100 $\mu g/100\ cm^2$ (GE 1986).

5.5 AOC 5 - RELEASE FROM UNDERGROUND TANKS D, E, F, G, AND N

Tanks D, E, and F are 10,000 gallon diesel tanks. Tank G is a 10,000 gallon gasoline tank and Tank N is a 650 gallon diesel tank. Soil excavation and sampling collected to assess subsurface conditions adjacent to Pier 91 tanks D, E, F, G, and N in August 1989 indicated soil and groundwater contamination resulting from releases at tanks G and N (ERM 1990). Tank N is located at the northeast corner of the old City Ice building. Tanks D, E, and F are situated immediately east of Tanks A, B, and C.

6.0 SITE INVESTIGATION STRATEGY

A detailed site investigation will be necessary to determine the status of many of the SWMUs and AOCs identified. A number of these units may no longer exist or be of concern.

The strategy of the VSI is to fill the following data gaps:

- Determine whether the closed units are still SWMUs
- Identify any additional SWMUs and AOCs not determined from the file review
- Understand process descriptions to identify additional SWMUs
- Determine the status of the cleanup of groundwater, soils, and perhaps estuarine sediments in select areas
- Determine the quantity of waste generated

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APPENDIX A

RCRA FACILITY ASSESSMENT REPORT

CHEMICAL PROCESSORS, INC.

PIER 91

SEATTLE, WASHINGTON

(Tetra Tech 1988)

JACOBS

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TES IV

DRAFT REPORT
RCRA FACILITY ASSESSMENT
CHEMICAL PROCESSORS, INC., PIER 91
SEATTLE, WASHINGTON

JE JACOBS ENGINEERING GROUP INC.
ENVIRONMENTAL SYSTEMS DIVISION

IN ASSOCIATION WITH:
TETRA TECH
METCALF & EDDY
ICAIR LIFE SYSTEMS
KELLOGG CORPORATION
GEO/RESOURCE CONSULTANTS
BATTELLE PACIFIC NORTHWEST LABORATORIES
DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES

U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL ENFORCEMENT SUPPORT
AT
HAZARDOUS WASTE SITES

RECEIVED
APR 29 1988
WASTE MANAGEMENT BRANCH

TES IV
CONTRACT #68-01-7351
WORK ASSIGNMENT NO. 683

DRAFT REPORT
RCRA FACILITY ASSESSMENT
CHEMICAL PROCESSORS, INC., PIER 91
SEATTLE, WASHINGTON

TETRA TECH, INC.
FOR
JACOBS ENGINEERING GROUP, INC.
PROJECT NUMBER: 05-B683-00
TC-3621-15

28 APRIL 1988

CONTENTS

FIGURES

1.0 INTRODUCTION

This report documents the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Chemical Processors, Inc. (Chempro) Pier 91 Facility (WAD000812917) located in Seattle, WA. The objectives of an RFA are to identify and gather information on releases at RCRA-regulated facilities to evaluate a facility's solid waste management units with respect to release of hazardous materials to all environmental media, and to determine the need for further actions and interim measures at the facility. This report combines the findings of the Preliminary Review (PR) phase and the Visual Site Inspection (VSI) phase of the RFA under the RCRA corrective action program. If sufficient evidence of contamination is found during the RFA, a RCRA Facility Investigation (RFI) may be required. As a result of the PR and VSI, some data gaps have been identified. The availability of data and summary of the project conclusions and recommendations are presented in this section.

1.1 PRELIMINARY REVIEW

The PR of the Chempro Pier 91 facility was conducted by examining and using information contained in U.S. EPA Region X and Washington Department of Ecology (Ecology) files. Additional information was obtained from local agencies including Puget Sound Air Pollution Control Agency (PSAPCA), the Municipality of Metropolitan Seattle (METRO) Industrial Waste Division, and the Port of Seattle Engineering Department. The following documents were reviewed:

- RCRA PART A Permit Application (Chemical Processors, Inc. 1982)

- Facility Inspection Reports (Ecology)

- Proposed Closure/Post-Closure Care Plan (Chemical Processors, Inc. 1987a)

- Waste Analysis Plan (Chemical Processors, Inc. 1986)

- CERCLA Preliminary Assessment/Site Investigation (U.S. EPA 1985)

- PSAPCA air monitoring inspection reports

- Metro wastewater discharge reports

- Hazardous waste manifests (Chemical Processors, Inc.)

- Facility/U.S. EPA correspondence letters

- Spill Inspection Reports (Ecology)

- Facility Contingency Plan (Chemical Processors, Inc. 1987b)

- Groundwater well drilling logs (Chemical Processors, Inc.)

- Chempro 1987 hazardous waste annual report

- Hazardous waste site evaluation report (Metcalf & Eddy, Inc. 1985).

The information gathered from these sources was used to identify and characterize potential releases from the Chempro Pier 91 facility, and to identify activities in subsequent phases of the RFA.

1.2 VISUAL SITE INSPECTION

The VSI for the Chempro Pier 91 facility was conducted on 28 March 1988. Site representatives for Chempro were Mr. Nate Mathews, Facility Manager, and Mr. Keith Lund, Compliance Specialist. The Tetra Tech, Inc. investigators were Mr. David Kleesattel and Mr. Brian O'Neal. A preliminary meeting was conducted to discuss the facility's history and operations. The site representatives discussed each waste management unit including waste characteristics, storage and treatment activities, maximum capacity, waste discharge and disposal.

The Chempro representatives conducted a tour of the facility and all waste management units. Questions and concerns regarding each unit were answered by site representatives during the tour. Photographs of the facility and waste management units were taken while touring the facility.

A closing meeting was conducted following the facility tour to identify and discuss remaining information and data gaps. The Chempro representatives agreed to supply information regarding past spill events, the 1987 Hazardous Waste Annual Report, and well logs from Chempro's recent groundwater investigation. The information was forwarded to Tetra Tech on 30 March 1988.

1.3 AVAILABILITY OF DATA/DATA GAPS

There was very little available information on the geology and hydrogeology of the Pier 91 industrial complex. The area was developed by adding fill material on top of tidal flat sediments. The groundwater is not used for domestic or industrial purposes. Therefore, information regarding parameters such as groundwater flow gradients, tidal influence on the aquifer, and soil permeability was not available.

Information gathered from PSAPCA was not specific to the Chempro, Inc. operation. The inspections performed by PSAPCA at Chempro Pier 91 focused only on boiler-stack emissions from the Pacific Northern Oil Company steam boiler. The past inspections have not included monitoring for air releases of petroleum associated, volatile organic compounds (Austin, F., 25 April 1988, personal communication).

Analytical data required for complete facility assessment was not obtainable from Chempro, Inc. The facility does not fully analyze all waste streams. The incoming waste is screened for general parameters such as total chloride, bottom sediment and water, and flashpoint. Other constituents such as heavy metals are not determined. The treated wastewater is analyzed for heavy metals, phenol, oil and grease, and pH (as per their Metro discharge permit). The waste sludge is not analyzed at Pier 91. The sludge is manifested as hazardous waste solid, not otherwise specified. The waste stream from the coolant treatment is also not analyzed before transport to Chempro, Lucille Street, Seattle. This materials is manifested as hazardous liquid waste.

Chempro has recently completed a soil and groundwater contaminant evaluation study (December 1988). The purpose of this study was for an internal facility assessment prior to Burlington Northern's purchase of the facility. This transaction was completed in early March 1988. The results of this study would be extremely useful for this RCRA Facility Assessment. However, Chempro did not wish to release the analytical findings of their study prior to submitting a formal document to U.S. EPA Region X. Therefore, groundwater chemical analysis information was not available at the time of preparing this RFA.

The PR did not reveal any previous groundwater investigations in the Chempro Pier 91 vicinity. However, several wells not installed by Chempro (B101, B102, and Station 10) exist at the facility. The Port of Seattle Engineering Department and Chempro representatives did not have any information regarding the history of these wells.

1.4 PROJECT CONCLUSIONS

The RCRA Facility Assessment requires the interpretation of environmental data to evaluate contaminant release, migration, and exposure potential. The available information (well and soil boring logs) suggest that the soil underlying the Chempro facility is relatively permeable. The soil consists of varying amounts of sand and gravel. This type of soil will allow liquid contaminants, such as petroleum and wastewater, to migrate easily to the groundwater. The well logs (see Appendix B) indicate that the water table aquifer fluctuates between 3 and 7 ft below surface.

The groundwater appears to be influenced by nearby (approximately 200 ft) Elliott Bay. The U.S. EPA Preliminary Assessment (U.S. EPA 1985) states that the groundwater is brackish. This suggests direct communication with the saline waters of Elliott Bay. This connection between the aquifer and Elliott Bay further suggests that contaminants originating from Chempro can migrate into the Puget Sound. The groundwater level measurements (Appendix B) indicate a flow direction to the south-southwest towards Elliott Bay.

The tidal influence on the local groundwater most likely causes a high degree of contaminant mixing (by hydraulic gradient fluctuation) beneath the site. Therefore, it would be extremely difficult if not impossible to identify the source for existing groundwater contamination with the present monitoring system. The existing wells are adequate to determine hydraulic gradients and tidal influence. A soil boring program such as that described in Sections 1.5 and 5.5.4 of this report would be necessary to identify specific contamination point sources.

Relatively permeable soils combined with a shallow water table make it likely that in the past large spills on the bare soil have reached the groundwater. Some preliminary evidence for groundwater and soil contamination was found in the borehole logs collected in late 1987. These facts coupled with a hydraulic gradient towards Elliott Bay indicate that groundwater is the major pathway of concern for past spills. The marine life in the bay is potentially at risk from past waste releases from Chempro. There are no producing groundwater wells within 0.5 mi of the site.

Records indicate that significant quantities of waste oil and wastewater have been released from the Chempro facility. The largest of these spills (in 1979) released an estimated 420,000 gal of waste oil onto the unpaved in the Marine Diesel Oil (MDO) Yard. Cleanup efforts apparently removed several cubic yards of soil. However, there are no records indicating any investigations to determine whether the remedial activities were successful in removing all contaminated soil. The presence of contamination in downgradient Wells CP-103 A & B suggest that contaminants from the MDO Yard have entered the aquifer.

Since the site has been completely paved (1986) the only mechanism by which future spills could enter the soil and groundwater would be through cracks in the pavement. This is potentially a significant problem if cracks occur beneath leaking tanks. The present daily tank inspection and lack of overflow alarms or automatic shut-off system is inadequate to detect leaks and minimize the potential for a release.

Air is also a potential pathway of concern for some of the more volatile petroleum and petroleum distillate compounds. The quantity of volatile organic compounds handled onsite is small. However, without analytical documentation to suggest otherwise, it was assumed that releases of volatile compounds is possible by normal operating practices. Because the anticipated emissions of organic compounds is low, the receptors of air contamination are restricted to Chempro employees only. The air pathway should be considered only as a potential occupational hazard.

Surface water is not considered a potential pathway of concern. All onsite surface water drains to Chempro's treatment process. Subsurface gas is not a migration pathway of concern because of the nature of potential contaminants.

1.5 PROJECT RECOMMENDATIONS

Chempro does not have an adequate tank testing program. The daily visual inspections may not detect leaks through the bottoms of the tanks (see Section 5). Significant quantities of wastes could be leaking into the permeable underlying soil. Therefore, it is recommended that Chempro implement a tank leak-testing program. The tanks should be tested on an annual basis to ensure continued tank integrity.

The facility should install overflow alarms on all tanks that are operated with open vents (units 3,4,5,7,10,11,12,13, and 15). Several past spills have been the direct result of tank overfilling (units 3 and 4). The facility manager indicated that an alarm system was soon to be tested on several tanks. If this system proves to be successful, it should be installed on all Chempro tanks.

The groundwater level monitoring information gathered by Chempro is inadequate to fully evaluate aquifer characteristics such as hydraulic gradients, permeability, and tidal influence. It is recommended that Chempro initiate a groundwater monitoring program with existing wells. This study should include quarterly monitoring to determine seasonal groundwater level variation and tidal influence on local hydraulic gradients (see Section 5.5.4).

As mentioned previously, the list of analytes and their concentrations in groundwater samples collected by Chempro were not available. When this information becomes available, the data should be analyzed for evidence of groundwater contamination. The analytes should include at a minimum volatile organic compounds, base-neutral acid (BNA) extractable compounds, and heavy metals. If Chempro's existing groundwater analytical program does not include the above analytes, additional sampling and analysis should be conducted to fill in the data gaps. These results should be used to design a more extensive soil and groundwater sampling program.

High priority should be given to conducting soil and groundwater sampling in the Marine Diesel Oil Yard to determine the nature and extent of contamination. The spills in this area prior to paving in 1986 have most likely contributed significant quantities of oily contaminants to the soil and groundwater (see Section 5.5). The study should also include an evaluation of potential aquifer contamination caused by migration of the contaminants presently in the soil.

Soil and groundwater samples should also be collected from the other tank yards, storm water sump, and in the immediate vicinity of the oil water separator. The soil boring program should be designed to determine the lateral extent of contamination. Because tidal influence on groundwater (and subsequently contaminant) movement is suspected, the soil boring program should not attempt to identify contaminant sources. Soil samples should be collected along the perimeter of the facility and from each of the bermed tank yards (both upgradient and down gradient locations). An estimated 15 soil borings would be required. The samples should be collected from discrete vertical intervals from the surface to within the saturated zone. The exact sample interval will be determined based on lithology and sampling technique.

2.0 DESCRIPTION OF FACILITY AND WASTE GENERATED

2.1 FACILITY DESCRIPTION AND HISTORY

The Chemical Processors, Inc. operate a waste oil treatment and recovery facility at Pier 91, located on the northern waterfront of Elliott Bay (see Figure 1). The 4 ac facility was originally owned and operated by Texaco, Inc. in the 1920s. Texaco transferred ownership to the U.S. Navy during World War II, with the City of Seattle operating the facility. The Navy later transferred ownership to the city. In 1971, the City of Seattle leased the facility to Chempro (Chemical Processors, Inc. 1987a). In turn, Chempro subleases approximately 60 percent of the Pier 91 treatment and storage complex to Pacific Northern Oil Company (PANOCO) for use as a marine fuel depot (Chemical Processors, Inc. 1987b). All of the oil treated and recovered by Chempro is sold to PANOCO.

The Chempro process system recovers oil from oily wastes (e.g., oily sludges, emulsified oil and water, waste machine oil, and oily water) and also treats wastewater and spent coolant contaminated with low concentrations of heavy metals and phenols (Chemical Processors, Inc. 1987c). The waste types treated include:

- Dirty/oily bilge water
- Pretreated oily wastes from other Chempro facilities
- Oily industrial wastewater, not otherwise specified (NOS)
- Spent industrial coolants (phenolic and non-phenolic)
- Waste machine oil from local automotive shops.

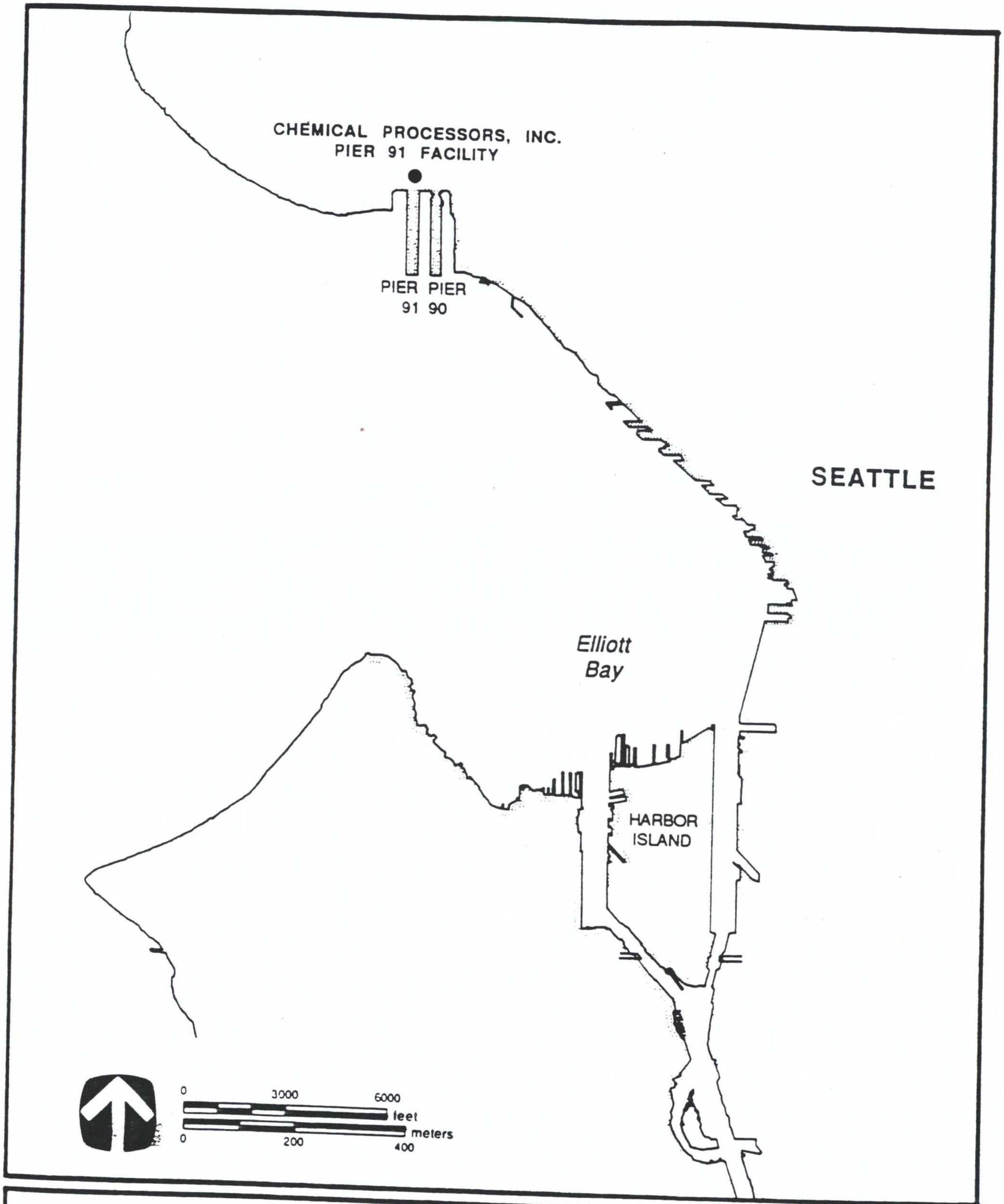


Figure 1. Location map of Chempro Pier 91 facility.

The Chempro Pier 91 treatment and storage facilities have a maximum capacity of approximately 8.5 million gal (including PANOCO storage). The waste materials are delivered to the facility via independently owned and operated barges and tank trucks. Chempro has not received any wastes from barges for over 1 yr. The treatment and recovery processes involve oil/water separation, thermal and chemical oxidation, precipitation, and centrifugation (Chemical Processors, Inc., 1986). These processes are discussed in further detail in Section 5 of this report.

The Chempro Pier 91 facility consists of an approximately 4-ac site (see Figure 2). The facility is completely paved and contains both asphalt and concrete areas. The concrete paving of the storage tank areas was completed in 1986. The concrete pavement in the vicinity of the oily wastewater truck off-landing area has several major cracks with separation gaps approximately 0.75 in wide (see Photo 5). The Black Oil and Marine Diesel Oil Yards are fully enclosed by a 15-17 ft masonry wall. The small storage and treatment yard is surrounded by a 5 ft masonry containment wall. All waste transfer is performed in above ground pipes. The process and storage areas outside the containment walls are secured by a chain-link fence, topped with barbed wire strands. The exceptions to this are the oily wastewater truck off-loading and oil/water separator areas located in the northwest quadrant of the facility (see Figure 2). Personnel from nearby industrial businesses other than Chempro, could potentially access these areas. The entire Pier 91 industrial complex has a guarded security gate and restricted entry. Therefore, the general public cannot gain access to the Chempro facility.

Chempro has a close working relationship with the subleasee, Pacific Northern Oil Company (PANOCO). Chempro provides oily wastewater treatment and waste oil recycling service to PANOCO (Mathews, N., 28 March 1988, personal communication). The recycled oil is sold back to PANOCO. The steam required for Chempro's thermal treatment process is generated by a PANOCO operated boiler located in the main warehouse. The PSAPCA air monitoring inspections conducted at the Chempro Pier 91 facility have focused on the emissions from PANOCO's boiler. The PSAPCA inspection this

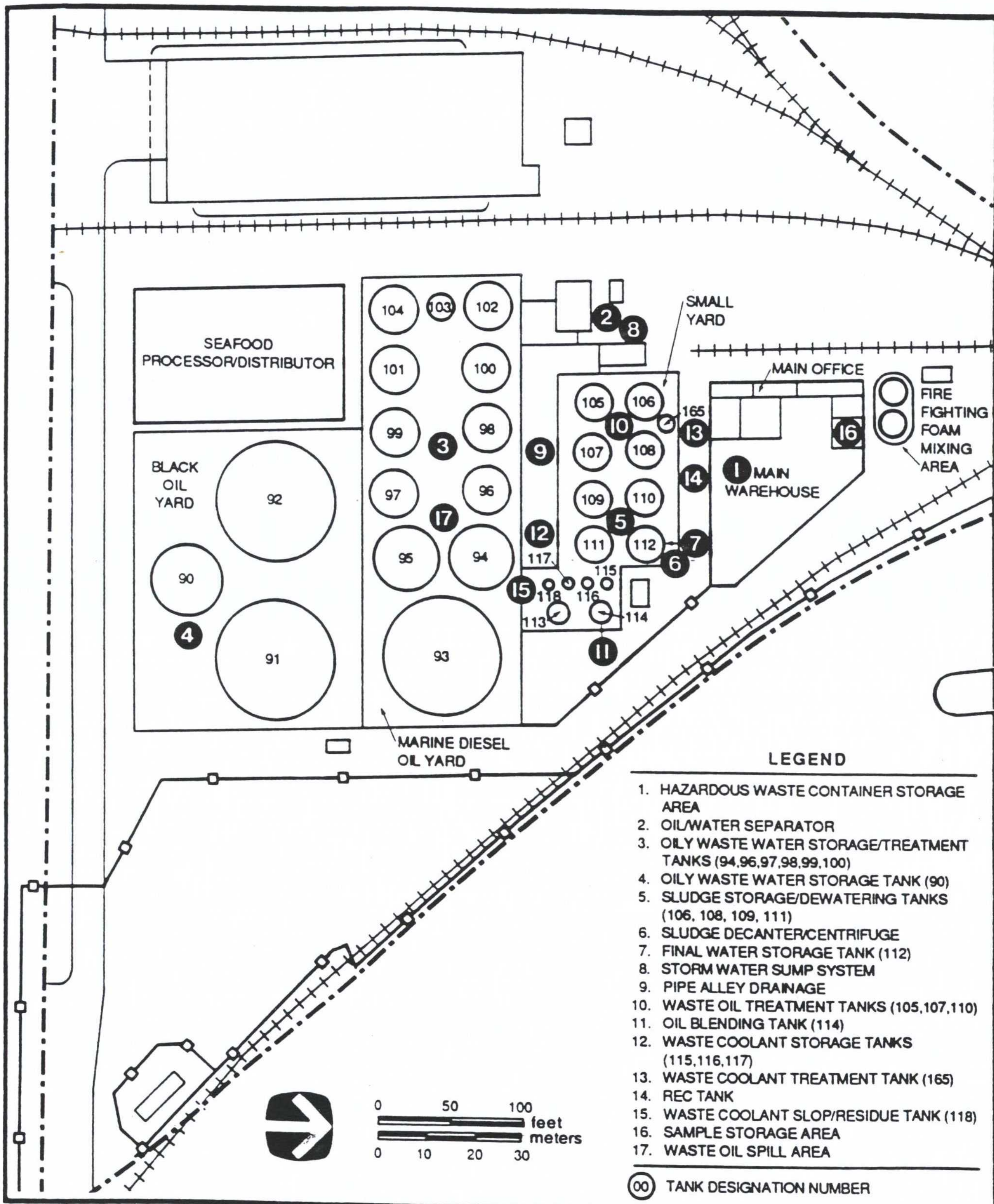


Figure 2. Map of RCRA-regulated and Solid Waste Mangement Units at the Chempro Pier 91 facility.

records do not specify any emissions originating from Chempro, Inc. processes. PSAPCA has issued over 10 violations to the Chempro Pier 91 facility since 1976. However, all of these violations have been the result of PANOCO's boiler stack emissions.

The onsite surface drainage is designed so that no surface runoff leaves the facility without first being treated. The treated water is discharged to the Metro sewer system (Permit No. 7099-R09/84-2). The facility has a storm water sump system which collects surface runoff from all areas except those contained within the bermed tank yards (see Section 5.1.7 of this report). The surface runoff in each of the individual tank yards drains to blind sumps within the containment areas. The water collected in these sumps is pumped into the Chempro water treatment system.

Chempro has recently implemented a soil sampling and groundwater analysis study. The results of the analyses were not available for evaluation at the time this report was prepared. Chempro is currently preparing a document with the results. Their report will be submitted to U.S. EPA Region X later this year. Preliminary data such as groundwater level measurements and soil boring logs were complete (see Appendix B). An evaluation of the well construction and water level measurements is presented in Section 2.3 and 2.4 of this report.

2.2 WASTES GENERATED

Chempro Pier 91 generates hazardous waste sludges from the thermal, chemical, and physical treatment of waste oil and oily wastewater. The sludges potentially contain significant concentrations of EP toxic constituents (e.g., lead and chromium) and volatile organic compounds associated with petroleum products. The waste sludge is transferred to the Lucille Street Chempro facility and eventually disposed of at the Chem Security Systems, Inc. landfill in Arlington, OR. The Pier 91 facility does not analyze the waste sludge prior to shipment to the Lucille Street facility. The sludge is manifested as hazardous waste solids not otherwise specified (NOS). The composition of the sludge is within the concentrations given in the waste profile data (see Appendix C). Therefore, the exact hazardous waste characteristics of the sludge are unknown at this time. Chempro has recently implemented an analytical program to determine the exact nature of the sludge currently stored in Tanks 106, 108, 109, and 111 (Mathews, N. 28 March 1988, personal communication). These initial analytical results will be included in a facility report submitted by Chempro to U.S. EPA Region X later this year.

The residues produced from the thermal and chemical treatment of phenolic and non-phenolic coolants are temporarily stored on site (Tank 118). This residue (coolant slop) is transported to the Chempro Lucille Street facility, and used as an alternative fuel. The coolant slop is manifested as a hazardous waste for shipment to Lucille Street. This material is not analyzed by Chempro Pier 91 (Mathews, N. 28 March 1988, personal communication). Therefore the exact nature of this material is unknown at this time.

2.3 ENVIRONMENTAL SETTING

2.3.1 Climate

The climate in Seattle, Washington along the northern shore of Elliott Bay is moderate. The annual precipitation is approximately 35 in. Late autumn and winter are the wettest seasons. The average maximum daily temperatures range from 35° F in January to near 70° F in July and August.

2.3.2 Geology/Hydrogeology

The Pier 91 industrial complex is underlain by anthropogenic deposits of unsorted and unstratified material. This material consists of clay, silt, sand, and gravel originating from dredgings from Elliott Bay and regrading activities in King County, Washington. The majority of the pier construction occurred in the early 1900s. The man-made fill material ranges from 0 to approximately 60 ft in thickness and is underlain by quaternary tidal flat deposits of clay, silt, and sand (Wells, R., 31 March 1988, personal communication).

The hydrogeology of the Pier 91 area is poorly understood. The fill material is generally poorly sorted (ranging from silt to coarse gravel). Because of the man-made deposition, well defined stratification of the material into laterally continuous layers is unlikely. The well logs from the nearby monitoring wells indicate a significant amount of sand and gravel overlying the quaternary tidal deposits (see Appendix B). The coarse nature of the material probably produces a relatively high permeability. The fill material most likely behaves as a tidally influenced, unconfined aquifer. Further hydrogeologic tests would be necessary to fully characterize the Pier 91 vicinity.

The groundwater in the Pier 91 area occurs approximately 3 to 7 ft below the ground surface (U.S. EPA 1985). The groundwater is described as being characteristically brackish contains a dissolved salt content between freshwater and saltwater. There are no producing groundwater wells within 0.5 mi of the Chempro Pier 91 facility (Kautz, M., 7 April 1988, personal communication). Chempro currently maintains six groundwater monitoring wells on site (see Figure 3).

The preliminary groundwater information collected by Chempro (December 1987; see Appendix B, Table 3.1) suggests that the groundwater flow direction is to the south-southwest towards Elliott Bay. This data from the well clusters located at CP-103 and CP-105 indicate a downward vertical gradient. However, it needs to be noted that this preliminary data was collected during a short time interval (2 days) and does not reflect seasonal fluctuations. Also, the time of measurement is not given. Groundwater variations induced by tidal activity cannot be evaluated at this time. Additional water level measurements need to be taken to determine seasonal and tidal influence on the local groundwater flow regime. For the purpose of this report, it is assumed that the groundwater flow direction is generally to the south-southwest.

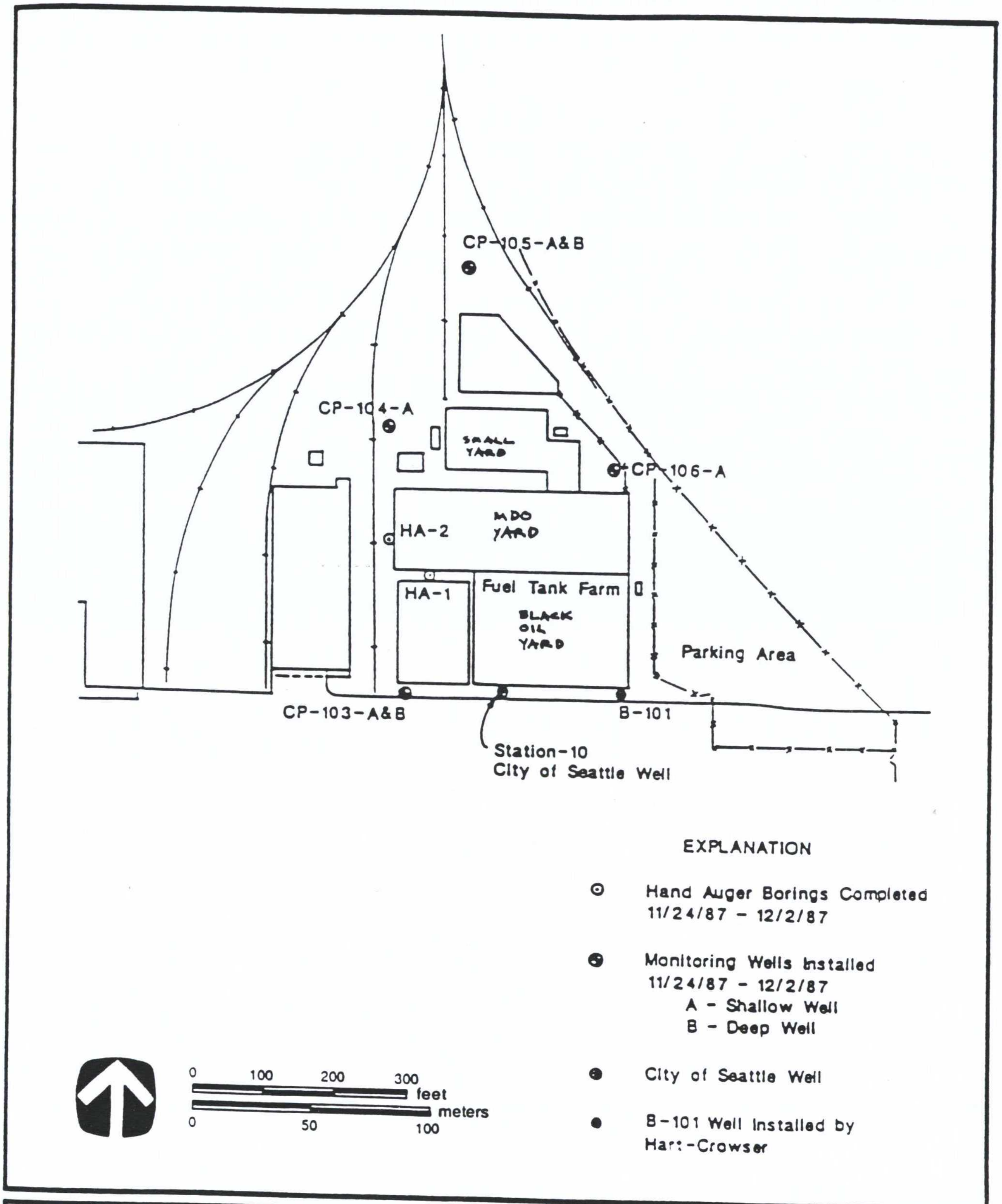


Figure 3. Map of groundwater wells at the Chempro Pier 91 facility.

2.3.3 Surface Water

The Chempro Pier 91 facility does not have any off-site surface drainage to local surface waters (Mathews, N., 28 March 1988, personal communication). There are no permanent streams or rivers in the immediate vicinity of the Chempro facility. The nearest surface water is Elliott Bay. The shore of the bay is approximately 200 ft from the Chempro facility (USGS 1983).

2.4 GROUNDWATER MONITORING SYSTEM

Chempro installed six groundwater monitoring wells in late 1987 (Lund, K., 30 March 1988, personal communication). The locations of these wells are shown in Figure 3. Soil samples were collected as part of the well installation activity. Boring logs, lithologic descriptions, well construction designs, and a water level summary are included in Appendix B.

The groundwater at the Chempro Pier 91 facility is shallow, ranging from 3 to 7 ft below the surface. The CERCLA Preliminary Assessment (PA) states that the groundwater is 3 ft deep. The recent Chempro data shows the water level as 6 to 7 ft below the surface. This discrepancy may reflect seasonal variation, recent drought conditions or tidal influence. The PA was conducted in March 1985, whereas the most recent information was collected in December 1987. The groundwater is brackish which suggests tidal influence and direct communication with nearby Elliott Bay.

The construction design of the monitoring wells generally appears to be adequate to intercept oily contaminants migrating from the facility. The construction details for Well CP-104-A are not included with the boring log. The adequacy of this well could not be fully evaluated. No product odor was noted in Wells CP-105-A & B during installation.

Monitoring Wells CP-105 A and B may be adequately located for use as upgradient (background) wells. However, additional water levels need to be taken and the tidal influence assessed to ensure these wells remain upgradient throughout the year. Also, analytical data needs to be obtained to prove that no contaminants are present in these wells. The wells located at CP-103, and possibly CP-104, should intercept contaminants migrating offsite (downgradient). The boring logs indicate a product odor in the soil at both these locations. Analytical results from samples collected in December 1987 will determine whether Chempro activities have adversely affected the aquifer quality.

The water levels in Monitoring Well CP-106 (December 1987) suggest that this well is hydrologically upgradient of the Chempro units (see Appendix B). However, a product odor was detected in the soil during well installation. This suggests that the groundwater elevations may be in error. Alternatively, groundwater mounding under the Marine Diesel Oil Yard, prior to the paving in 1986, may have allowed spilled waste oil to migrate to the vicinity of CP-106. Regardless, this well should not be used as a background well.

3.0 LOCATIONS OF RCRA-REGULATED UNITS AND SOLID WASTE MANAGEMENT UNITS

One RCRA-regulated unit and 16 solid waste management units (SWMUs) were identified during the PR and VSI of the Chempro Pier 91 facility in Seattle, WA. The RCRA-regulated unit is defined as:

- Unit 1. Hazardous Waste Container Storage Area.

The 16 SWMUs are:

- Unit 2. Oil/Water Separator
- Unit 3. Oily Wastewater Storage/Treatment Area
- Unit 4. Oily Wastewater Storage/Treatment Tank 90
- Unit 5. Sludge Dewatering/Storage
- Unit 6. Sludge Decanter/Centrifuge
- Unit 7. Final Water Storage Tank
- Unit 8. Storm Water Sump System
- Unit 9. Pipe Alley Drainage
- Unit 10. Waste Oil Treatment Tanks
- Unit 11. Oil Blending Tank
- Unit 12. Waste Coolant Storage Tanks

- Unit 13. Waste Coolant Treatment Tank

- Unit 14. Rec Tank

- Unit 15. Waste Coolant Slop/Residue Tank

- Unit 16. Sample Storage Area

- Unit 17. Waste Oil Spill Area

The locations of these units are shown in Figure 2. Locations of groundwater monitoring wells at the Chempro Pier 91 facility are shown in Figure 3. Descriptions of these units are provided in Sections 4.0 and 5.0 of this report.

4.0 RELEASE INFORMATION FOR RCRA-REGULATED UNITS

A discussion of the RCRA-regulated hazardous waste management units at the Chempro Pier 91 facility is provided in this section.

4.1 UNIT 1. HAZARDOUS WASTE CONTAINER STORAGE

4.1.1 Description

The hazardous waste container storage area, located within the main building (#19) on the Pier 91 Facility (see Figure 2) is approximately 200 ft^2 in area and consists of an unbermed, concrete floor (see Photos 26-28). The hazardous wastes (sludges) are stored in 55-gal drums and are all marked with appropriate labels. Labels were examined during the VSI and it was noted that the labels do not indicate the date of accumulation or storage (see Photo 29). Several of the drums were either severely damaged or stored open. The facility does not routinely inspect this area or have any records indicating the length of storage time at that site (Mathews, N., 28 March 1988, personal communication). The plant manager indicated that these particular hazardous wastes have been stored there for at least 1 year.

Chempro is in the process of removing the existing hazardous waste drums from the facility. The waste sludges are first transferred to the Chempro Georgetown (Lucille Street) facility, then disposed of at Chemical Security Systems, Inc. (CSSI) located in Arlington, OR. Pier 91 has not generated any drummed, waste sludges for approximately one year. At the time of the visual site inspection, 13 drums of waste sludge were being stored in the designated hazardous waste container area. Facility personnel indicated that up to 160 drums have been stored in this area at one time (Mathews, N., 28 March 1988, personal communication).

4.1.2 Waste Characteristics

The hazardous wastes stored in drums consist of sludges generated by the thermal treatment of waste oil and by gravity induced oil/water separation. The sludges are prepared for transportation by a mechanical decanter/centrifuge process. The decanter has not been operated since mid-1987. The waste sludges generated during the Chempro treatment processes typically contain significant concentrations (>500 ppm) of heavy metals such as chromium and lead (lead 0-10,000 ppm and chromium 0-1,000 ppm; see Appendix C). The sludges are not analyzed prior to transportation to the Lucille Street Chempro facility. Therefore, there are no analytical data sheets to determine the concentration of specific constituents in the waste sludge. The waste profile data are tabulated in Appendix C. The composition of the sludge will be within these profile value ranges (Mathews, N., 28 March 1988, personal communication).

4.1.3 Migration Pathways, Evidence of Release, and Exposure Potential

The hazardous waste storage area is isolated from groundwater and surface water migration pathways by the concrete floor and controlled surface drainage (see Photos 26-28). To date, there has been no evidence collected which indicates contamination has been released from this unit. At the time of the VSI, one drum was apparently leaking (see Photo 27). However, the plant manager indicated that recent precipitation had leaked into the warehouse, and the water near the drums was the result of rain water drainage. There were no other obvious chemical stains caused by drum leakage on the floor. Subsurface gas is not a potential pathway of concern because of the nature of the waste.

Air is a pathway of slight concern, because one drum was partially opened and particulate material could escape from the container. Typically this unit would not produce potentially hazardous vapors because of the very low volatility of the hazardous waste constituents (heavy metals). If all drums are stored properly (e.g., sealed), air would not be a potential pathway of concern. The only receptors for the air pathway are the Chempro employees. Surface water is not a pathway of concern because the area is located inside a building and all potential surface drainage in this area is directed to the storm water sump system (see Section 5.1.7).

4.1.4 Conclusions and Recommendations

No further action under the RFA/RFI process is recommended for the hazardous waste container storage area. However, wastes contained in damaged or leaking drums need to be repackaged in proper containers. Drums which contain hazardous waste should not be stored opened. An inspection schedule needs to be implemented for the hazardous waste container storage area as required under interim status regulations (40 CFR Part 265 Subpart I). These inspections would be useful in identifying problems associated with waste storage such as leaking waste drums, improperly covered drums, or drums that are stacked inappropriately.

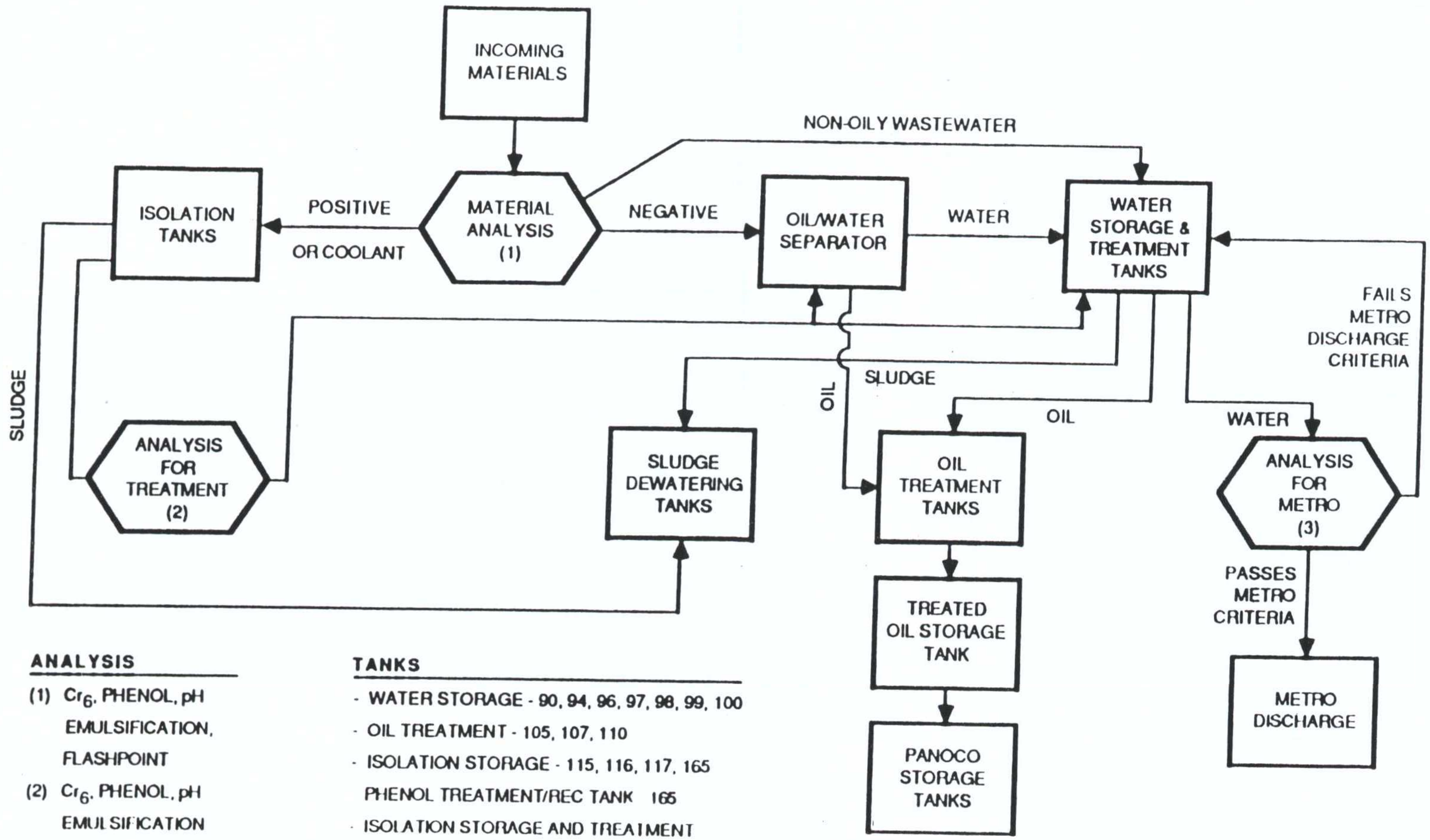
5.0 RELEASE INFORMATION FOR SOLID WASTE MANAGEMENT UNITS

A discussion of the 16 SWMUs at the Chempro Pier 91 facility is presented below.

5.1 OILY WASTEWATER TREATMENT

The oily wastewater treatment system is used to treat incoming waste from off-site industrial locations. This system is also used to treat all on-site surface water drainage, and oily wastewater from the adjacent PANOCO activities. A summary of the wastewater treatment process is given in Figure 3. The incoming wastewater is analyzed (screened) for a number of waste characteristics prior to being off-loaded into the Chempro treatment system (see Figure 4). The initial screening analysis includes tests for total chlorides, phenol, pH, emulsification, and flashpoint. Waste with total chlorides greater than 1,000 ppm is rejected. The rejected wastewater is either returned to the generator or transported to the alternative facility as indicated on the manifest. The determination whether the wastewater is oily or non-oily is performed by a visual examination (Mathews, N., 28 March 1988, personal communication). Wastewater containing phenol and coolant is pumped to the phenolic isolation/treatment system (see Section 5.3 of this report). The wastewater that is classified as non-phenolic and non-oily is pumped directly to the wastewater storage and treatment tanks. All non-phenolic, oily wastewater is off-loaded directly to the oil/water separator.

Oil collected from the oil/water separator is pumped into the oil treatment tanks (see Section 5.2 of this report). The water fraction is pumped to the water storage and treatment tanks (see Figure 4). The treatment includes gravity dewatering, thermal treatment, and precipitation. Waste oil, emulsified liquids, and sludge is produced during treatment. The oil and emulsified liquids are treated in the oil treatment tanks (105, 107, and 110). The sludge is dewatered in the decanter/centrifuge unit. The



ANALYSIS

(1) Cr_6, PHENOL, pH EMULSIFICATION, FLASHPOINT
(2) Cr_6, PHENOL, pH EMULSIFICATION
(3) HEAVY METALS, OIL AND GREASE, pH

TANKS

- WATER STORAGE - 90, 94, 96, 97, 98, 99, 100
- OIL TREATMENT - 105, 107, 110
- ISOLATION STORAGE - 115, 116, 117, 165
  PHENOL TREATMENT/REC TANK 165
- ISOLATION STORAGE AND TREATMENT
  EMULSIFIED LIQUIDS - 105, 107, 110
- SLUDGE DEWATERING - 106, 108, 109, 111

Figure 4. Flow diagram of the Chempro Pier 91 oily and non-oily wastewater and coolant treatment process.

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treated wastewater is tested against the Metro sewer discharge permit parameters. If the wastewater meets the Metro criteria, the water is transferred to Tank 112 to await discharge to the sewer system. Any wastewater not meeting the discharge criteria is pumped back into the wastewater storage and treatment tanks. The Metro discharge permit standards are as follow:

Oil and grease	100 ppm
pH	5.5-12.5
Cadmium	3.0 ppm
Chromium	6.0 ppm
Copper	3.0 ppm
Nickel	6.0 ppm
Lead	3.0 ppm
Zinc	5.0 ppm

The facility slope is designed to prohibit offsite surface water drainage. There are five separate storm water collection areas. Each of the three bermed tank yards have separate blind sumps. When the sumps are full, pumps are manually started and the water is transferred to the oily wastewater treatment system. These blind sumps are not interconnected and will not release storm water from the facility.

Oil contaminated storm water also collects in the Chempro and PANOCO pipe alleys (see Photos 11 and 25). These two pipe alleys are adjacent, but behave as discrete units. Oily water in both these units is pumped into Chempro's oil/water separator.

The on-site storm water drainage, outside the contained areas, is collected in a sump system (see Photos 5 and 6). This system is separate from the tank yard blind sumps, pipe alleys, and sewer discharge system. The storm water is collected in a brick-lined sump located immediately northeast of the oil/water separator. The storm water is pumped directly into the oil/water separator for treatment. This system does not allow off-site drainage to surface water.

Eight solid waste management units make-up the oily wastewater treatment process:

- Oil/water separator
- Oily wastewater storage/treatment area
- Oily wastewater storage/Treatment Tank 90
- Sludge dewatering/storage
- Sludge decanter/centrifuge
- Final water storage tank
- Storm water sump system
- Pipe alley drainage.

Detailed description for each of the above SWMUs are presented below. The analytical data from the groundwater, soil, and sludge dewatering tank sampling were not available at the time this report was prepared. The data is forthcoming from Chempro and will be integrated into the final report.

5.1.1 Unit 2. Oil/Water Separator

5.1.1.1 Description--

The oil/water separator is located in the northwest quadrant of the facility immediately adjacent to the truck off-loading area (see Figure 2). The capacity of this unit is approximately 40,000 gal (Mathews, N., 28 March 1988, personal communication). The separator is constructed of concrete and is completely recessed within the surrounding pavement. The unit is completely covered with a steel grating (see Photo 4). The grating prohibits objects from falling into the unit. A blind sump trough is located between the oil/water separator and the main access road to the west. The trough is approximately 12 in deep and 8 in wide. Oily water from this trough is manually pumped into the oil/water separator. The capacity of this blind sump would be inadequate to contain a major spill during oily wastewater off-loading. However, the facility slope would prevent off-site migration via a surface water pathway.

Incoming oily wastewater is pumped directly into the oil/water separator from bulk tank trucks (see Photos 2 and 3). Surface water drainage is collected in the adjacent sump to the east of the separator. The contents of this sump are pumped directly into the oil/water separator (see Photo 5).

5.1.1.2 Waste Characteristics--

The oil/water separator contains oily wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. Volatile organic compounds may also be present in the separator. The facility does not routinely analyze the oil/water separator constituents (wastewater and oily sludges).

5.1.1.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern in the event of cracking and leaking at the oil/water separator. There are no records indicating any leaks or spills from this unit. The groundwater is shallow, approximately 5 ft, and the native soil in the vicinity is sand (see Appendix B, Well Log CP-104). Contamination has been observed in the downgradient wells CP-103 A and B and in well CP-104 located 50 ft to the west of this unit (see Figure 3 and Appendix B). The facility has no record of inspection of the separator. The exact age and construction design of the unit is unknown. The concrete pavement in the general vicinity shows signs of significant failure (see Photo 5). There are no human receptors which use the groundwater within 0.5 mi (Kautz, M., 7 April 1988, personal communication). However, the groundwater flows into Elliott Bay approximately 200 ft to the south of the site. Contaminant release into the bay could potentially affect marine organisms.

Air is a potential pathway of concern. Volatile constituents associated with petroleum products (e.g., benzene) can be released from the oil/water separator. There were no monitoring records at this unit to evaluate ambient air quality. The air pathway should only be considered as a potential occupational hazard and not a source for extensive environmental contamination because of the low volatile organic compound concentration and high potential for wind dispersion of any emissions. The primary receptors of concern within 0.5 mi include the ten Chempro employees.

Surface water is not a pathway of concern because all facility drainage is to the stormwater sump system (see Section 5.1.7). Subsurface gas is not a pathway of concern at the oil/water separator because the compounds contained within this unit would not be expected to generate dangerous (explosive) subsurface gases during degradation and volatilization.

5.1.1.4 Conclusions and Recommendations--

The most recent analytical groundwater data need to be evaluated. This data is to be submitted by Chempro to U.S. EPA Region X in the near future. Because this information was not released prior to the preparation of this report, the evaluation could not be presented here. Monitoring Wells CP-103 and CP-104-A may be adequate to detect contaminant migration from the oil/water separator. However, the construction details are not included on the well log. If significant contamination is detected in monitoring well CP-104-A, and the contaminant characteristics match expected wastes from the oil/water separator, a groundwater monitoring program should be designed and implemented to determine the extent of contamination in the soil and groundwater in this area (see Section 5.5.4 for specific recommendations). The absence of detectable contaminants in Well CP-104-A should not be used as evidence for no release until the groundwater flow direction has been established. The facility should drain the oil/water separator and inspect the unit for cracks or evidence of concrete fatigue.

5.1.2 Unit 3. Oily Wastewater Storage/Treatment Area

5.1.2.1 Description--

The oily wastewater storage/treatment area is located in the Marine Diesel Oil (MDO) yard (see Figure 2). The area consists of six mild steel tanks having the following capacities:

Tank	Capacity (bbl)
94	10,189
96	6,212
97	6,282
98	6,401
99	6,019
100	6,477.

The total capacity is 41,580 bbl (1,746,360 gal). The tanks have plate steel bottoms and are constructed on concrete foundations. The construction date and specific design of these tanks is unknown. The tanks are equipped with internal steam lines used to heat the contents to 190° F. The area surrounding the tanks is completely paved with concrete (completed in 1986). The MDO yard is surrounded by a 15 ft containment wall. The facility has no record of tank leak testing since Chempro leased the property in 1971. Visual tank inspections are performed daily, and an inspection log is kept in the main office. The top vents of all tanks are kept open. None of the tanks have alarms or automatic shutoffs to prevent overfilling.

5.1.2.2 Waste Characteristics--

The tanks contain only wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. This waste stream is not analyzed and concentrations of contaminants are unknown. Low concentrations of volatile organic compounds may be present in the wastewater.

5.1.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The tanks have not been leak-tested for at least 17 yr. The tank bottoms and concrete pads could possibly have developed cracks, allowing waste to seep into the soil. The soil beneath the tanks is sandy and probably very permeable (see Appendix B, well log CP104-A). Groundwater is 3 to 7 ft below the surface. A spill of waste oil (40,000 gal) occurred from Tank 94 prior to paving of the surface (Mathews, N., 28 March 1988, personal communication). Barrels of oil contaminated soil from past spills in the Marine Diesel Oil yard are stored near Tank 93 (see Photo 15). There are no human groundwater receptors within 0.5 mi (Kautz, M., 7 April 1988, personal communication). Contaminated groundwater could potentially affect Elliott Bay.

Air is a potential pathway of concern in the immediate area because the tanks are vented directly to the air. Volatile compounds associated with petroleum wastes and oily wastewater can be released from the open tank vents during the thermal treatment process. The receptors at risk from the air pathway would include only Chempro employees.

Subsurface gas is not a pathway of concern because the wastes associated with this unit will not generate dangerous gases. Surface water is not a pathway of concern because all surface drainage is directed to blind sumps within the containment area.

5.1.2.4 Conclusions and Recommendations--

Because the groundwater is shallow, the intervening soil consists of sand and gravel (see Appendix B), and there are records of past spills, contaminant migration from this area is likely. The well log from downgradient well CP-103-B indicates soil contamination. Groundwater samples should be analyzed to determine the nature of contaminants. The source for the contamination is unknown. Borehole soil and groundwater samples should be collected and analyzed from wells immediately upgradient and downgradient from the vicinity of the spill to determine the nature and extent of contamination caused by waste oil spills (see Section 5.5.4). The facility should implement a tank leak-testing program.

5.1.3 Unit 4. Oily Wastewater Storage/Treatment Tank 90

5.1.3.1. Description--

Tank 90 is located in the Black Oil Yard (see Figure 2). Details of the construction design and date is not known. The justification for separating this tank from the other oily wastewater storage/treatment tanks is by its physical location. The capacity of Tank 90 is approximately 14,691 bbls (617,022 gal). The top vent is kept open, and the tank does not have an automatic shut-off or alarm system. The Black Oil Yard is contained by a 15 ft concrete wall. The entire area within the wall is paved with concrete. The tank is inspected visually daily. There are no records of tank leak-tests for Tank 90.

5.1.3.2 Waste Characteristics--

The tank contains oily wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. Volatile organic compounds may also be associated with this waste. Analytical data for the wastes contained within this tank are not available.

5.1.3.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). The groundwater well logs for downgradient wells CP-103 A & B indicate the presence of an oily material in the soil and groundwater. Past leakage from this unit may have contaminated those wells. Tank 90 shows signs of having been overfilled. Oil stains are obvious from the top vents (see Photo 18). The groundwater receptor within 0.5 mi is Elliott Bay and the associated marine life.

Air is a potential pathway of concern because the open tank vent allows volatile organic compounds to be released to the atmosphere (see Section 5.1.2.3). There is no analytical data on the ambient air quality in the vicinity of this unit. The receptors at risk from the air pathway would include only Chempro employees.

Subsurface gas and surface water are not pathways of concern as described for Unit 3, Section 5.1.2.3.

5.1.3.4 Conclusions and Recommendations--

Since there is no direct evidence of past releases at this unit, no further action under the RFA/RFI process is recommended specifically for this unit. However, there is a potential for contamination beneath this and other units at the facility from documented and undocumented spills. The overall extent of this suspected contaminant plume should be characterized. The area around the tank was only recently paved (1986). Any spills prior to that time could have contaminated the soil and groundwater. The analytical results from the samples collected at CP-103 should be evaluated to determine if contaminants are present in the soil and groundwater which could have originated from upgradient units including Tank 90. These results were not available for review at the time of this report preparation. If these results show contamination, additional borehole soil and groundwater samples should be collected and analyzed from several locations to attempt to further characterize the contamination plume. See Section 5.5.4 for specific recommendations.

5.1.4 Unit 5. Sludge Dewatering/Storage

5.1.4.1 Description--

The sludge dewatering/storage tanks are located in the Small Yard (see Figure 2). These tanks are designated as Tanks 106, 108, 109, and 111. All four tanks are constructed of mild steel with a steel base on a concrete pad. The capacity of each tank is 1,171 bbl (49,182 gal). The exact date of construction is unknown. Chempro has used the tanks since leasing the facility in 1971. Chempro has never performed leak-testing on those four tanks. The tank vents are kept open and do not have an automatic shut-off or overflow alarm system.

The tanks are fully contained within the Small Yard by a 5-ft retaining wall. The entire area is paved with concrete (since 1986, see Photos 23 and 24). Surface drainage is to the blind sumps within the containment area.

The tanks are currently being used to store dewatered sludge. The decanter/centrifuge has been out of operation for approximately 1 yr. The sludges have been collecting in these tanks for approximately 5 yr (Mathews, N., 28 March 1988, personal communication). All tanks are filled to near capacity.

5.1.4.2 Waste Characteristics--

The waste sludge contained in these tanks has potentially high concentrations of lead, chromium, and zinc (see Appendix C). The facility has recently collected samples of the sludge for analysis, but the results were unavailable for this report (Mathews, N., 28 March 1988, personal communication). Chempro is in the process of preparing a report with the results of these analyses to be submitted to U.S. EPA Region X.

5.1.4.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with the other tanks in the oily wastewater treatment system, soil and groundwater are major pathways of concern (see Section 5.1.2.2). The daily visual tank inspections would not detect leakage through the tank bottom and underlying concrete tank foundation. Elliott Bay is the groundwater receptor of concern within 0.5 mi.

Air is a potential pathway of concern because the open vents allow volatile organic compounds to be released to the atmosphere. However, the concentration of volatile organic compounds is expected to be extremely low at this point in the treatment process. The potential for air release is extremely low. The primary receptors of concern within 0.5 mi are the Chempro employees. There is no analytical data on the ambient air quality in the vicinity of the Small Yard.

Subsurface gas and surface water are not pathways of concern as described for Unit 3, Section 5.1.2.3.

5.1.4.4 Conclusions and Recommendations--

Soil borings and groundwater samples should be collected and analyzed in conjunction with the recommended program as described in Section 5.5.4 to determine whether contamination has migrated into the underlying soil at the Small Yard. Evaluation of the analytical data from the most recent sludge sampling activity needs to be performed to fully characterize the nature of the stored wastes. This material may be classified as land disposal restricted waste, which would prohibit the facility from storing it for more than a 1 yr period. All tanks used for sludge dewatering should be leak-tested on a periodic schedule.

5.1.5 Unit 6. Sludge Decanter/Centrifuge

5.1.5.1 Description--

The decanter/centrifuge unit is currently inoperable. The unit has been out of order for approximately 1 yr (Mathews, N., 28 March 1988, personal communication). The facility manager indicated that the decanter has been repaired and will be put back into operation in the near future. The operating capacity of the unit is roughly 35 gal/min of sludge.

The unit is located in the northeast corner of the Small Yard (see Figure 2), immediately adjacent to the 5 ft containment wall (see Photo 12). The decanted sludge is generated within the confines of the Small Yard. The sludge is transferred to 55-gal drums on the outside of the contaminant area via conveyor belt. Because the unit was not in operation, hazardous waste container loading procedures were not observed during the visual site inspection.

5.1.5.2 Waste Characteristics--

The waste sludge potentially contains high concentrations of heavy metals such as lead, chromium, and zinc (see Appendix C). The wastes are not routinely analyzed and no analytical data are presently available for evaluation. However, recent sampling in Unit 5 (sludge dewatering tanks) will provide analytical data needed to evaluate waste characteristics. Chempro is to submit this data to U.S. EPA Region X.

5.1.5.3 Migration Pathways, Evidence of Release, and Exposure Potential--

This unit is located on a concrete pad and contained within the berm of the Small Tank yard. Therefore, groundwater, soil, surface water, and subsurface gas are not presently pathways of concern. Air is a slight pathway of concern when the unit is operating. Any residual volatile organic compound present in the sludge may be able to escape into the air. Also particulate material produced during the decanting process may become airborne. The receptors of concern would be the facility personnel (approximately 10 people).

5.1.5.4 Conclusions and Recommendations--

No further action under RFA/RFI process (see Section 5.1.3.4). The waste handling practices at this unit do not pose environmental release hazards. The facility may want to implement an air monitoring program during operating periods of this unit.

5.1.6 Unit 7. Final Water Storage Tank

The Final Water Storage Tank (Tank 112) is located in the northeast corner of the Small Yard (see Figure 2). This tank is composed of mild steel constructed on a concrete foundation and has a capacity of 1,171 bbl (49,182 gal). Tank 112 is used as a final storage tank for treated wastewater prior to discharge into the Metro sewer system. The tank is inspected visually every day for signs of leakage.

The justification for classifying this tank as a SWMU is because at times, the treated wastewater does not meet Metro discharge standards (e.g., pH below 5.5, heavy metals content, or oil and grease over 100 ppm). Therefore, this tank can, and has been, used to store waste and should be treated as a waste management unit.

5.1.6.2 Waste Characteristics--

Tank 112 contains treated wastewater. The Metro permit standards require the pH to range between 5.5 and 10.5, oil and grease content to be below 100 ppm, and the heavy metal content as listed in Section 5.1. Chempro has a history of violations with respect to their discharge permit (Municipality of Metropolitan Seattle 1982). Therefore, the wastewater contained in Tank 112 has exceeded the above criteria.

5.1.6.3 Migration Pathways, Evidence of Release, and Exposure Potential

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is relatively permeable (see Appendix B). As with all other Chempro tanks, Tank 112 has not been leak-tested within the past 17 yr. There is no evidence of spills or leaks from Tank 112. Groundwater receptor within 0.5 mi is the Elliott Bay habitat.

Air is not a potential pathway of concern because any volatile organic compounds present would be released during the treatment processes. The concentrations of volatile compounds at this point in the Chempro process is expected to be extremely low or nonexistent.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because this unit is contained within the small tank yard. All surface drainage is directed to the blind sump system.

5.1.6.4 Conclusions and Recommendations--

As with other Chempro tanks, cracks or fatigue in the tank bottom and concrete foundations may be present. If the tanks are leaking through the foundations, contaminants could be migrating into the soil. Soil boring and groundwater samples should be collected in conjunction with the recommendations as in Section 5.5.4. Chempro should leak-test this tank.

5.1.7 Unit 8. Storm Water Sump System

5.1.7.1 Description--

The facility storm water drainage is a closed system. No surface drainage flows directly off-site. The system consists of several storm drains located throughout the facility. The main collection point of the drainage system is a sump located in the northwest quadrant of the facility (see Figure 2).

The sump is constructed of 8 in clay bricks (see Photos 5 and 6). At the time of the visual site inspection (VSI), the sump was full of oily water. This water was being pumped into the oil/water separator. The facility does not inspect the sump for leaks. The pavement immediately surrounding the sump is damaged (see Photo 5).

This storm water sump system does not collect water from the contained tank yards. The facility manager indicated that storm water from offsite drains into Chempro's system. Chempro's agreement with Metro is to treat all surface water that drains into the Chempro system (Mathews, N., 28 March 1988, personal communication).

5.1.7.2 Waste Characteristics--

The sump could potentially contain any material spilled on-site. At the time of the VSI, the sump contained oily wastewater, similar to that observed in the oil/water separator. There is no analytical data on the nature of waste in the storm drain.

5.1.7.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are major pathways of concern. The brick construction of the sump would most likely promote contaminant migration into the soil and groundwater. The bottom of the sump is below the local groundwater level. The groundwater receptor within 0.5 mi of the site is Elliott Bay.

Air is a minor pathway of concern. Volatile compounds associated with spill petroleum products could be present in the sump. However, it is not anticipated that the concentration of volatiles in this material would be significant.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because the entire unit is below surface level.

5.1.7.4 Conclusions and Recommendations--

The sump provides a very high potential for groundwater and soil contamination. The sump should be inspected for evidence of release. A possible method to check this would be to drain the unit completely dry and observe any infiltration of groundwater into the sump. If groundwater can enter the sump, contaminated storm water can also enter the aquifer. The entire storm water drain system should be inspected for potential leaks. If it is determined that the sump is leaking, the walls should be sealed to prevent contaminated storm water from migrating into the aquifer.

5.1.8 Unit 9. Pipe Alley Drainage

5.1.8.1 Description--

The pipe alley is a shallow trough approximately 3 ft deep, 25 ft wide, and 100 ft long. The pipe alley is located between the Marine Diesel Oil Yard and Small Yard. The alley is constructed of concrete and is isolated from the tank storage areas by concrete containment walls (see Photo 11).

Storm water collects in the pipe alley. At the time of the visual site inspection, the alley was filled with dark, oily water and the alley foundation was obstructed from view. Chempro pumps this water into their oil/water separator for treatment.

5.1.8.2 Waste Characteristics--

The oily water in the pipe alley has not been analyzed. The oil contamination source is unknown. The oil may be leaks from the Pacific Northern Oil Company's product lines as well as leaks from the Chempro system.

5.1.8.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are pathways of concern. The groundwater is shallow and the intervening soils are permeable (see Appendix B). The water in the pipe alley is obviously contaminated with an oily substance. Because the contamination source is unknown, the environmentally conservative assumption is that the substance is waste oil from the Chempro operation. The observation of product in the soil at the downgradient well location CP-103-A and B suggests possible contaminant migration from this source. Elliott Bay is the primary receptor of concern within 0.5 mi of the site.

Air is a potential pathway of concern. Volatile organic compounds associated with petroleum products may be present, especially if new product is leaking from PANOCO fuel tank pipes. However, the pipe alley should only be considered as a occupational hazard and not a source for extensive environmental contamination. There is no air monitoring data for the pipe alley area. The receptors of concern would be Chempro employees.

Surface water is not a pathway of concern because the pipe alley is totally bermed. Subsurface gas is not a pathway of concern because of the nature of the wastes.

5.1.8.4 Conclusions and Recommendations--

The pipe alley may provide a potential pathway for groundwater and soil contamination. The alley should be inspected for leaks, and all cracks sealed. If major cracks are discovered, soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 to determine the nature and extent of contamination. At a minimum, samples of the oily wastewater in the alley should be collected to determine the nature of the contaminants and possibly identify the source.

5.2 WASTE OIL TREATMENT

Chempro treats waste oil for resale. The waste oil treated at Chempro is delivered by bulk tank trucks. These trucks are owned and operated by independent transporters. The Chempro Pier 91 facility does not generally accept drums of waste oil. However, if a customer makes arrangements with the facility, waste oil in 55-gal drums can be accepted. Waste oil collected by the facility's oily wastewater treatment process is also treated for resale.

All incoming oil is analyzed for total chloride including PCB, flashpoint and bottom sediment and water (BS&W; see Figure 5). If the total chlorine content is over 1,000 ppm, and/or the flashpoint is less than 140^{o}F, the waste oil is rejected. Waste oil that passes the total chloride screen and flashpoint test is analyzed for total BS&W. If the BS&W is less than 12 percent, the waste oil can be pumped directly into the oil blending

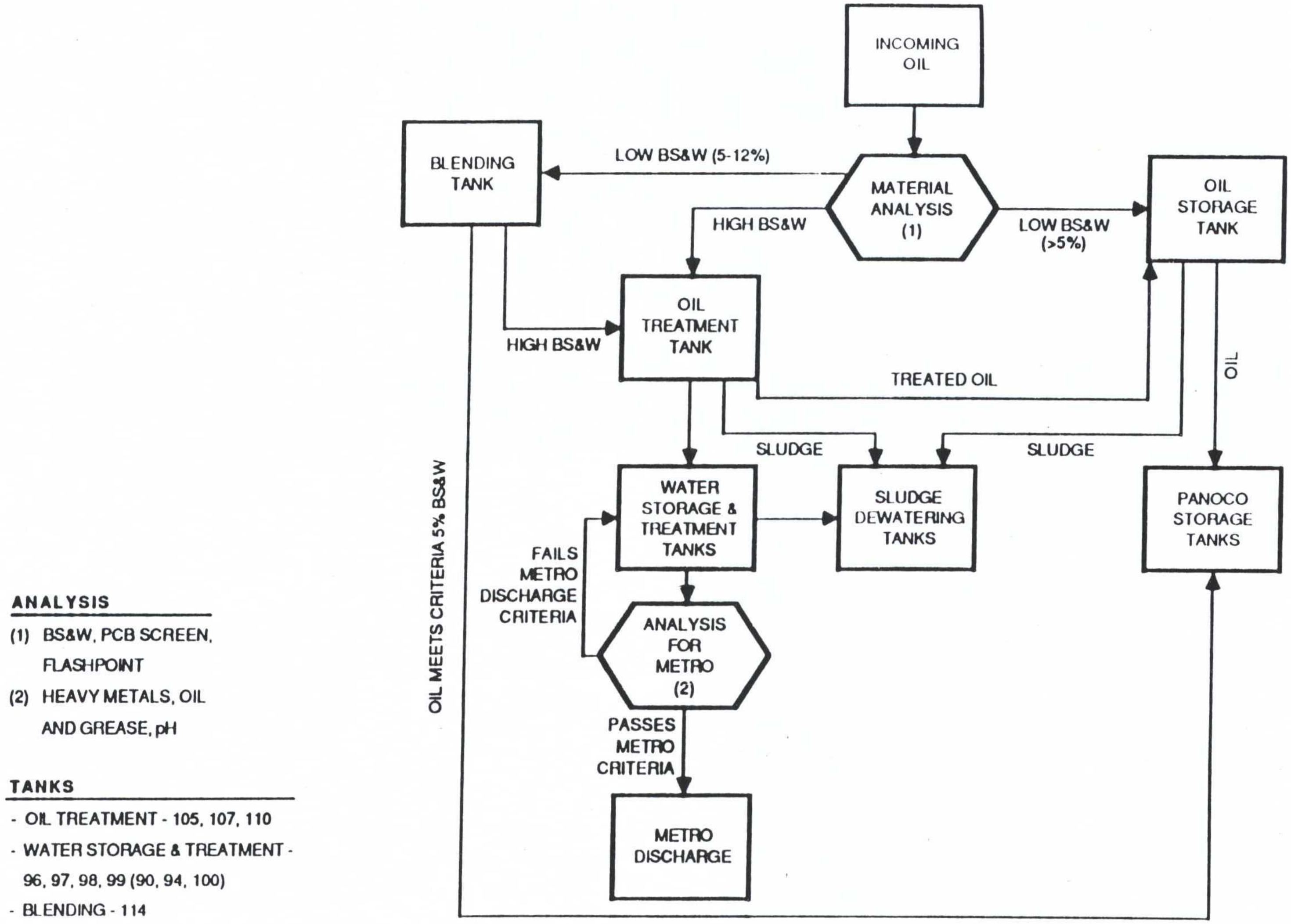


Figure 5. Flow diagram of the Chempro Pier 91 waste oil treatment process.

tank (Tank 114, see Figure 2). Waste oil with over 12 percent BS&W is pumped to the oil treatment tanks. Incoming waste oil with less than 5 percent BS&W, is pumped directly to Tank 102. This tank is owned and operated by PANOCO.

The waste oil with high BS&W is heated to 190^{o}F and treated with sodium silicate to separate the sediment and water. Emulsified oil is also treated in these tanks by heating to it 190^{o}F and treating it with calcium chloride.

PANOCO

After treatment, the recovered oil is transferred to Tank 114 for blending and resale (see Figure 5). The wastewater is analyzed for the Metro permit standards and either discharged to the sewer system or treated until the criteria are met. The sludge is transferred to the dewatering/storage tanks and prepared for subsequent centrifugation and shipment off-site (see Figure 6). The decanter/centrifuge unit is currently non-functional. Therefore, all sludges are being stored in Tanks 106, 108, 109, and 111.

The two solid waste management units associated with the waste oil treatment processes are:

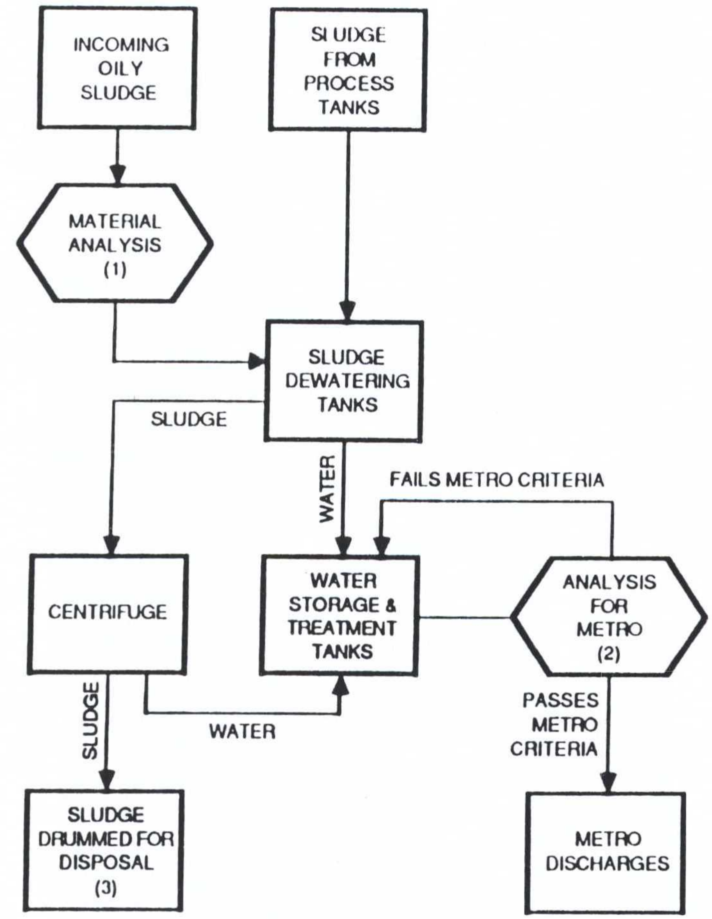
- Waste oil treatment tanks
- Oil blending tank.

The detailed descriptions for each of these two SWMUs are presented below.

5.2.1 Unit 10. Waste Oil Treatment Tanks

5.2.1.1 Description--

The waste oil treatment tanks are located in the Small Yard (see Figure 2). The tanks included in this system are designated as Tanks 105, 107, and 110. Each tank has a maximum capacity of 1,171 bbl (49,182 gal). The tanks are constructed of mild steel placed on a concrete foundation. The area surrounding the tanks is completely covered with concrete and is



ANALYSIS

(1) BS&W

(2) HEAVY METALS, OIL AND GREASE, pH

(3) HAZARDOUS WASTE CHARACTERIZATION

TANKS

- SLUDGE DEWATERING - 106, 108, 109, 111
- WATER STORAGE & TREATMENT - 96, 97, 98, 99 (90, 94, 100)

Figure 6. Flow diagram of the Chempro Pier 91 oily sludge treatment process.

contained by a 5 ft masonry wall (see Photos 8, 9, and 10). The exact date of tank construction is unknown. Chempro conducts daily visual inspections on each of these tanks. However, the tanks have not been leak-tested since Chempro leased the facility in 1971. All tanks vent directly to the atmosphere and are normally kept open. None of the tanks have automatic shut-off controls or overflow alarms.

5.2.1.2 Waste Characteristics--

Tanks 105, 107, and 110 contain waste oil with bottom sediment and water contents in excess of 12 percent. The waste oil potentially contains heavy metals such as lead, chromium, and zinc (see Appendix C). The waste oil is not analyzed for organic composition. The waste oil potentially contains volatile organic compounds associated with petroleum products.

5.2.1.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). Downgradient wells (CP-103, see Figure 3) show signs of soil contamination. If the tank bottoms and concrete foundation have any leaks, the daily visual inspections may not reveal release of waste. The area surrounding these tanks do not show any signs of spillage or overflow. The primary receptor within 0.5 mi is Elliott Bay.

Air is a potential pathway of concern because the tanks vent directly to the air (see Section 5.1.2.3). The treatment process involves heating the waste oil to 190^{o} F. This process may cause the release of petroleum associated volatile organic compounds (e.g., benzene). However, the concentration of volatile compounds is expected to be very low, and the wind will disperse emissions from the tank vents. There is no analytical data on the air quality of vapors venting from the tanks. The receptors at risk are primarily Chempro employees.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because the drainage in the tank yard feeds to the blind sump.

5.2.1.4 Conclusions and Recommendations--

These tanks need to be leak-tested to determine whether release through the tank bottoms and concrete foundation is occurring. Soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 in the Small Yard to determine the extent, if any, of soil contamination.

5.2.2 Unit 11. Oil Blending Tank

5.2.2.1 Description--

The oil blending tank (Tank 114) is located in the northeast corner of the Small Yard (see Figure 2). This tank is constructed of mild steel placed on a concrete foundation. The maximum capacity is 1,240 bbl (52,069 gal). The tank is inspected daily for visual signs of leakage or overflow. The tank has not been leak-tested for the past 17 yr. The tank does not have an automatic shut-off control or overflow alarms.

The oil blend tank can receive waste oil directly from the oil truck off-loading area if the oil has less than 12 percent bottom sediment and water content (see Figure 5). Therefore, this tank can receive and distribute untreated waste oil.

5.2.2.2 Waste Characteristics--

The oil blending tank can contain untreated waste oil. The sediment in this waste can potentially contain heavy metals such as lead, chromium, and zinc. Metal analyses are not performed on the incoming oily wastes. Volatile organic compounds may be present in the waste oil.

5.2.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with all tanks at the Chempro Pier 91 facility, the groundwater and soil are potential pathways of concern. Contamination has been detected in the soil at Wells CP-103, 104, 106 (see Figure 3). The source of this contamination has not been identified. Elliott Bay is the primary receptor of concern within 0.5 mi.

Air is a potential pathway of concern (see Section 5.2.1.3). The tank is vented directly to the atmosphere. Volatile organics associated with petroleum products may be released to the air. There is no analytical data for the air quality in the blending tank vicinity. The receptors within 0.5 mi include Chempro employees.

Subsurface gas is not a potential pathway because of the nature of the material involved. Surface water is not a pathway of concern because the tank is contained within the Small Yard bermed area.

5.2.2.4 Conclusions and Recommendations--

This tank presents a moderate potential for release to the soil and groundwater. The tank shows no outwardly visible evidence of leakage or spillage. However, until the source of groundwater contamination has been identified, this Chempro tank should be considered a potential source (see Section 5.1.3.4). The tank should be leak-tested.

5.3 WASTE COOLANT TREATMENT

Chempro treats phenol contaminated oil, wastewater, and coolants. The phenol contamination is typically the result of additives used to control biological activity. The Chempro process can treat wastes with maximum phenol concentrations of 2,000 to 3,000 ppm. Not all waste coolants accepted by Chempro are contaminated with phenol. However, both phenol contaminated oil, wastewater, coolant, and non-phenolic coolant are stored and treated in the same units (Tanks 115, 116, 117, and 165). This section will include a discussion of all treatment processes relevant to these units.

Incoming phenol contaminated wastes and coolants are isolated from the oil wastewater and oil treatment units (see Figure 4). The coolant or phenolic waste is pumped into storage Tanks 115, 116, or 117. This waste is treated in Tank 165. The Rec Tank was formerly used for coolant treatment. This tank has been decommissioned, dismantled, and removed from the Pier 91 facility.

The phenol contaminated oil and wastewater treatment process involves chemical oxidation by using sulfuric acid, ferrous sulfate, and hydrogen peroxide or potassium permanganate. A chemical reduction process follows the oxidation. The pH of the waste is increased to 10.5 by the addition of sodium hydroxide. Sodium metabisulfite is added to reduce the hexavalent chromium to trivalent chromium. Phenolic and non-phenolic coolants are treated with a sulfonate modifier, flocculants, caustics, and calcium chloride.

Residual sludges from the oxidation and reduction processes of phenolic oil and wastewater are transferred to Tanks 106, 108, 109, and 111 for dewatering and subsequent centrifugation. The wastewater is analyzed ~~for~~ Metro permit standards prior to discharge. The residue from the coolant treatment is transferred to Tank 118 for storage ~~and~~ subsequent shipment to the Lucille Street Chempro facility. This residue is used as an alternative fuel material.

what is this? Oil?

Four solid waste management units have been identified in the waste coolant treatment system. These units are:

- Waste coolant storage area

- Waste coolant treatment tanks

- Rec tank (former coolant treatment tank)

- Waste coolant slop/residue tank.

Detailed descriptions for each of these four SWMUs are presented below. Analytical data were not available at the time this report was prepared. The information is forthcoming and will be integrated into the final report.

5.3.1 Unit 12. Wastewater Coolant Storage Area

5.3.1.1 Description--

The waste coolant is stored prior to treatment in Tanks 115, 116, and 117 located on the eastern portion of the Small Yard (see Figure 2). The tanks are constructed of mild steel on a concrete foundation. The exact date of construction is unknown. The tanks are taller and have a smaller diameter than the other tanks in the Small Yard (see Photo 23). The area surrounding the tanks is completely paved with concrete. The coolant storage tanks are contained by the berm surrounding the Small Yard. The tanks vent directly to the atmosphere through open top vents. The tanks do not have any automatic shut-off controls or overflow alarms. These tanks are inspected daily for visual signs of leaks or spills.

5.3.1.2 Waste Characteristics--

These tanks contain both phenol contaminated wastewater and coolant as well as non-phenolic coolant. The maximum phenol concentration of wastes treated by Chempro is 2,200 ppm. This waste may also contain heavy metals and volatile organic compounds.

5.3.1.3 Migration Pathway, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the soil underlying the area is permeable (see Appendix B).

The tanks were probably constructed at the same time as the other Chempro tanks. The tank bottoms and concrete foundations may leak, and the visual inspections conducted by Chempro may not reveal such leaks. There is no analytical evidence that indicates contamination from these tanks. Groundwater receptor within 0.5 mi of the facility in Elliott Bay.

Air is a potential pathway of concern. The tanks are vented to the atmosphere. Phenol vapors and volatile organic compounds can escape from the tank. The air pathway should only be considered a potential occupational hazard and not a source for extensive environmental contamination because of the low volatile organic compound concentration and potential for wind dispersion of any emissions. The receptors within 0.5 mi include the Chempro employees.

Subsurface gas is not a pathway of concern because of the nature of the compounds stored in the tanks. Surface water is not a pathway of concern because of the nature of the compounds stored in the tanks. Surface water is not a pathway of concern because the tanks are contained within the bermed, small tank yard.

5.3.1.4 Conclusions and Recommendations--

These tanks present a potential source of contamination the groundwater. These tanks need to be leak-tested. Soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 to determine whether phenolic contaminants have entered the soil from this location.

5.3.2 Unit 13. Waste Coolant Treatment Tank

5.3.2.1 Description--

Tank 165 is used for the treatment of coolant and phenolic wastewater. This tank is located in the Small Yard between Tanks 106 and 108. The tank is constructed of mild steel with a concrete foundation. The details of construction are unknown. The maximum capacity is 282 bbl (11,844 gal). The area surrounding Tank 165 is paved with concrete. The contents of the tank are contained within the Small Yard by a 5 ft masonry wall (see Photo 32). The tank contains steam lines for thermal treatment and is vented directly to the atmosphere. The tank does not have an automatic shut-off control or overflow alarm. The tank is inspected daily for leaks and spills.

5.3.2.2 Waste Characteristics--

This tank contains both phenol contaminated wastewater and coolant as well as non-phenolic coolant. The maximum phenol concentration of waste treated by Chempro is 2,200 ppm. The wastes may also contain volatile organic compounds and heavy metals.

5.3.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

The migration pathways, evidence of release, and exposure potentials for this unit are the same as for Unit 12 (waste coolant treatment area, see Section 5.3.1.3).

5.3.2.4 Conclusions and Recommendations--

Because groundwater and soil are potential pathways of concern, soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 in the Small Yard to determine whether contaminants have been released into the soil or groundwater. All tanks in the waste coolant treatment and storage system should be leak-tested.

5.3.3 Unit 14. Rec Tank (Former Coolant Tank)

5.3.3.1 Description--

The rec tank has been removed from the Chempro Pier 91 facility. The tank was located immediately north of the Small Yard containment wall (see

Figure 2). The former treatment tank was a rectangular tank with dimensions 30 ft x 8 ft x 3.5 ft. The tank was equipped with steam lines for thermal treatment. The tank had a steel bottom and was set directly on the concrete pavement. The tank was not in a bermed area. The surface drainage was to the storm water sump system (see Photo 33). The tank was reportedly cleaned, dismantled, and shipped to Chempro Lucille Street for further decontamination.

5.3.3.2 Waste Characteristics--

The waste characteristics are identical to Unit 13 (waste coolant treatment Tank 165).

5.3.3.3 Migration Pathways, Evidence of Release, and Exposure Potential--

This unit was operated in an unbermed area. The pavement is cracked and pitted (see Photo 33). Therefore, groundwater and soil are potential pathways of concern from past spills. There are no reported spills from this unit. Air, surface water, and subsurface gas are not pathways of concern because this unit is no longer in existence at the Chempro facility. Elliott Bay is the primary groundwater receptor within 0.5 mi of the facility.

5.3.3.4 Conclusion and Recommendations--

The former coolant treatment (rec) tank could have released contaminants to the storm sewer system (Unit 8). The fatigued condition of the adjacent pavement could have potentially allowed contaminants to enter the soil, and subsequently the groundwater. Groundwater and soil samples should be collected and analyzed in conjunction with the program in the MDO Yard (see Section 5.5.4) to determine whether phenolic compounds have entered the aquifer (see Section 5.1.3.4). Monitoring well CP-106 is potentially downgradient and may be adequate to monitor release from this unit. However, further hydrogeologic data is needed to fully evaluate the groundwater flow direction (see Section 2.4).

5.3.4 Unit 15. Waste Coolant Slop/Residue Tank

5.3.4.1 Description--

Tank 118 is used to store the residue (slop) from the phenolic wastewater and coolant treatment. This tank is located in the eastern end of the Small Yard near the coolant storage tanks (see Figure 2). The tank is constructed of mild steel placed on a concrete foundation. The date of construction is unknown. The maximum capacity is approximately 429 bbl (18,000 gal). Tank 118 is located within the Small Yard containment wall (see photo 23). The tank is inspected daily for leaks and spills (Lund, K., 30 March 1988, personal communication). There are no automatic shut-off or overflow alarms on Tank 118.

5.3.4.2 Waste Characteristics--

The coolant treatment residues potentially contain phenols and heavy metals. Chempro does not analyze this waste stream. The residue is manifested as a hazardous waste liquid when transported to the Lucille Street Chempro facility.

5.3.4.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with the other units at the Chempro facility, groundwater is a potential pathway of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). The tank has not been leak-tested for at least 17 yr. The daily inspection will not detect contaminants migrating through the concrete foundation. Elliott Bay is the groundwater receptor of concern within 0.5 mi of the facility.

Air is not a potential pathway of concern because the volatile constituents probably have been evolved during the thermal treatment process (see Section 5.3.2.3).

Surface water is not a pathway of concern because the residue tank is contained within the Small Tank Yard. All surface water is this area drains to blind sumps. Subsurface gas is not a pathway of concern because of the nature of the waste.

5.3.4.4 Conclusions and Recommendations--

This unit poses a moderate potential for groundwater contamination. The entire surrounding area is paved with concrete. Leak-testing should be performed on this tank along with all other tanks at the Chempro facility. Groundwater sampling and monitoring at Well CP-106 (see Figure 3) and soil borings in the Small Yard should be performed in conjunction with the program described in Section 5.5.4 to determine whether phenolic contaminants from Tank 118 are entering the aquifer. The absence of contaminants in well CP-106 should not be used as evidence for contaminant from this unit. Groundwater measurements are inconclusive to determine the exact flow direction of the aquifer (see Section 2.4).

5.4 UNIT 16. SAMPLE STORAGE AREA

5.4.1 Description

The sample storage area is located in the main warehouse (see Figure 2). This area is used to store incoming sample aliquots (duplicates). The sample room has an unbermed, concrete floor. There are no floor drains in the room. Samples are placed in cardboard boxes (photos 30 and 31). These boxes are in poor condition and are stacked on one another. The storage room has inadequate shelf space. Most of the boxes of samples are on the floor. Various sample container types are used (e.g., nalgene, glass, and stainless steel). The sample storage room is not locked or restricted from general facility personnel. Samples have been stored in this area for over 1 yr. The daily facility inspection does not include this area (Mathews, N., 28 March 1988, personal communication).

not required unless waste. J.P.

5.4.2 Waste Characteristics

The sample bottles contain all types of incoming waste streams sampled at Chempro. This includes samples from rejected shipments. The waste types include waste oil, coolant, phenolic wastewater, and chlorine contaminated wastes.

5.4.3 Migration Pathways, Evidence of Release, and Exposure Potential

Several of the sample containers appear to be leaking (see photo 31). The cardboard boxes have oil stains and the floor also has stains. The duplicate samples are not kept in an orderly fashion. Filled sample bottles were observed in a garbage can with general refuse (see photo 36). Releases from the sample storage area cannot migrate to the groundwater. Therefore, groundwater is not a pathway of concern. Air, surface water, and subsurface gas are also not pathways of concern because of the small sample quantity, contained surface drainage, and nature of waste. Because the sample duplicates are not kept in a secure area, the facility personnel can come into contact with spilled sample material.

5.4.4 Conclusions and Recommendations

The sample storage area presents a minor source for environmental contamination. However, the storage techniques and practices may lead to the spillage of small quantities of potentially hazardous waste. The facility should implement a sample duplicate storage procedure which reduces the risk of spills and ensures that potentially incompatible wastes are stored properly.

5.5 UNIT 17. WASTE OIL SPILLS

5.5.1 Description

Accidental spills have occurred repeatedly in the Marine Diesel Oil Yard (see Figure 2). Approximately 520,562 gal of oil, waste oil, and oily wastewater has been reportedly spilled in this general vicinity (Lund, K., 30 March 1988, personal communication). The Marine Diesel Oil Yard is contained by a 15 ft masonry wall. However, prior to 1986, the surface of the tank yard was native soil. Approximately 485,000 gal was spilled on the unpaved surface. In 1986 some of the oil contaminated soil was excavated and placed in 55-gal drums. The surface of the tank yard was paved with concrete. The drums of oil contaminated soil remain next to Tank 93 (see photo 15). Other contaminated soil was sealed in boxes constructed between the buttresses on the containment wall. Waste oil is currently seeping from these boxes (see photo 14).

Chempro has recently performed a soil sampling study (December 1987). Two samples were collected hydraulically downgradient from the Marine Diesel Oil Yard. These locations are designated as HA-1 and HA-2 (see Figure 3). This study was performed in conjunction with the groundwater sampling. The analytical results are forthcoming.

5.5.2 Waste Characteristics

The wastes released during these spill events have the same characteristics of the other materials that Chempro handles as discussed in previous sections. The waste potentially contains heavy metals such as lead, chromium, and zinc as well as volatile organic compounds.

5.5.3 Migration Pathways, Evidence of Release, and Exposure Potential

Groundwater is the major pathway of concern. The soil is relatively permeable (sand and gravel) and the water table aquifer is approximately 3 to 7 ft below the land surface (see Appendix B). An oily material (product) has been observed in the soil at Monitoring Well CP-103 which is downgradient of the spills. The source of this material is unknown, but may be the result of past spills in the Marine Diesel Oil Yard. Groundwater receptor of concern within 0.5 mi of the facility is Elliott Bay.

Because the nature of the spilled material is relatively non-volatile, and the spill area has been cleaned, air is not a pathway of concern. Surface water is not presently a pathway of concern because the spill area is completely contained within the berms. Subsurface gas is not a pathway of concern because of the nature of the spilled material.

5.5.4 Conclusions and Recommendations

The spills which occurred prior to the paving of the Marine Diesel Oil Yard pose the most serious threat to soil and aquifer contamination at the Chempro facility. The facility should conduct soil boring and analysis program to determine the vertical extent and nature of soil contamination.

Continued groundwater monitoring at the newly installed downgradient groundwater wells (CP-103 A & B) is recommended to detect contaminant migration and to confirm groundwater flow direction, tidal and seasonal water level variation.

In addition, a soil boring and groundwater sampling program should be implemented to include the areas within the Marine Diesel Oil Yard, the Black Oil Yard, and the Small Yard. These should include samples from both the vadose (unsaturated) and saturated zones. Because the suspected tidal influence may strongly affect local hydraulic gradients and subsequent contaminant migration directions, it may be difficult to determine the exact source of soil and groundwater contamination. Therefore, the soil boring program should be designed and implemented to determine the lateral extent of contaminant source. The recommended tank leak-testing will be better suited to identify potential contamination point sources. Groundwater samples should be collected and analyzed to determine the nature of groundwater contaminants.

This drilling and sampling program will also help characterize the contamination problem that may exist underneath the entire site as a result of undocumented releases from other units. As mentioned previously (in connection with other units), the majority of units at the site potentially could have released contaminants to the soil and groundwater before the site was paved. Some may be releasing contaminants presently via leaking tanks and cracked concrete tank foundations.

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APPENDIX A

VISUAL SITE INSPECTION PHOTOGRAPHIC LOG
28 MARCH 1988

ATTACHMENT A. PHOTOGRAPHIC LOG

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 1
Date 3-28-88 Time 1300-1500
Unit

Description Waste oil truck off-loading area

Photographer Facing North
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 2
Date 3-28-88 Time 1300-1500
Unit

Description Oil/water separator area

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 3
Date 3-28-88 Time 1300-1500
Unit

Description Oily wastewater truck off-loading area

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 4
Date 3-28-88 Time 1300-1500
Unit

Description Oil/Water Separator

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 5
Date 3-28-88 Time 1300-1500
Unit

Description Storm water sump

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 6
Date 3-28-88 Time 1300-1500
Unit

Description Storm water sump
Brick-lined sump

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 7
Time 1300-1500

Description Operator testing laboratory

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 8
Time 1300-1500

Description Small tank yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 9
Time 1300-1500

Description Small tank yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 10
Time 1300-1500

Description Small tank yard

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 11
Time 1300-1500

Description Pipe alley

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 12
Time 1300-1500

Description Sludge decanter/centrifuge

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 13
Time 1300-1500

Description Groundwater well near Tank 13

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 14
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 15
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing North
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 16
Time 1300-1500

Description Wastewater sump in black oil yard
oil on ground from PANOCO tank

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 17
Time 1300-1500

Description Wastewater sump in black oil yard
oil leaking from PANACO tanks

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 18
Time 1300-1500

Description Oily wastewater Tank 90
evidence of oil overflow

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 19
Time 1300-1500

Description Oily wastewater Tank 90

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 20
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 21
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 22
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 23
Time 1300-1500

Description Waste coolant storage treatment

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 24
Time 1300-1500

Description Small yard storage/treatment tanks

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 25
Time 1300-1500

Description PANOCO sump area

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 26
Time 1300-1500

Description Hazardous waste container storage area

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 27
Time 1300-1500

Description Leaking hazardous waste drum

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 28
Time 1300-1500

Description Hazardous waste storage drum
damaged drum

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 29
Time 1300-1500

Description Label on hazardous waste drum
No start date

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 30
Time 1300-1500

Description Sample storage area
spill sample container

Photographer Facing Southeast
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 31
Time 1300-1500

Description Sample storage area

Photographer Facing Southeast
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 32
Time 1300-1500

Description Coolant treatment tank 165

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 33
Time 1300-1500

Description Former Rec Tank area

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1

Date 3-28-88

Unit

Photo No. 34

Time 1300-1500

Description Tank 94

Residue from overflow

Photographer Facing East

Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1

Date 3-28-88

Unit

Photo No. 35

Time 1300-1500

Description Spill area in marine diesel oil yard

oil spill residue on tanks

Photographer Facing West

Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1

Date 3-28-88

Unit

Photo No. 36

Time 1300-1500

Description Discarded waste samples in garbage cans

Photographer Facing North

Photographer Name O'Neal

CHEMPRO PIER 91
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28 MARCH 1988

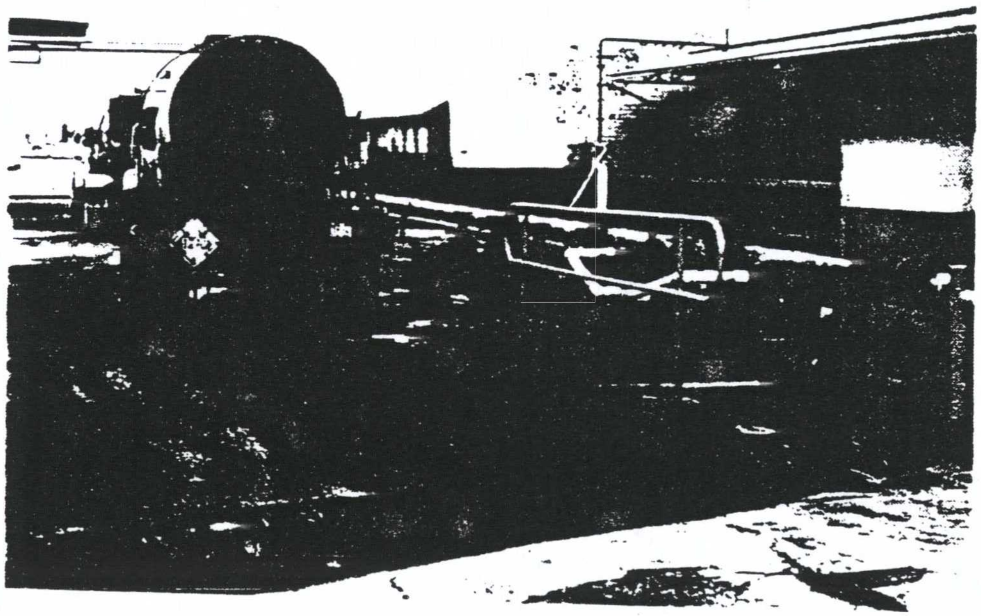

Photo 1. Waste oil tank truck off-loading area.

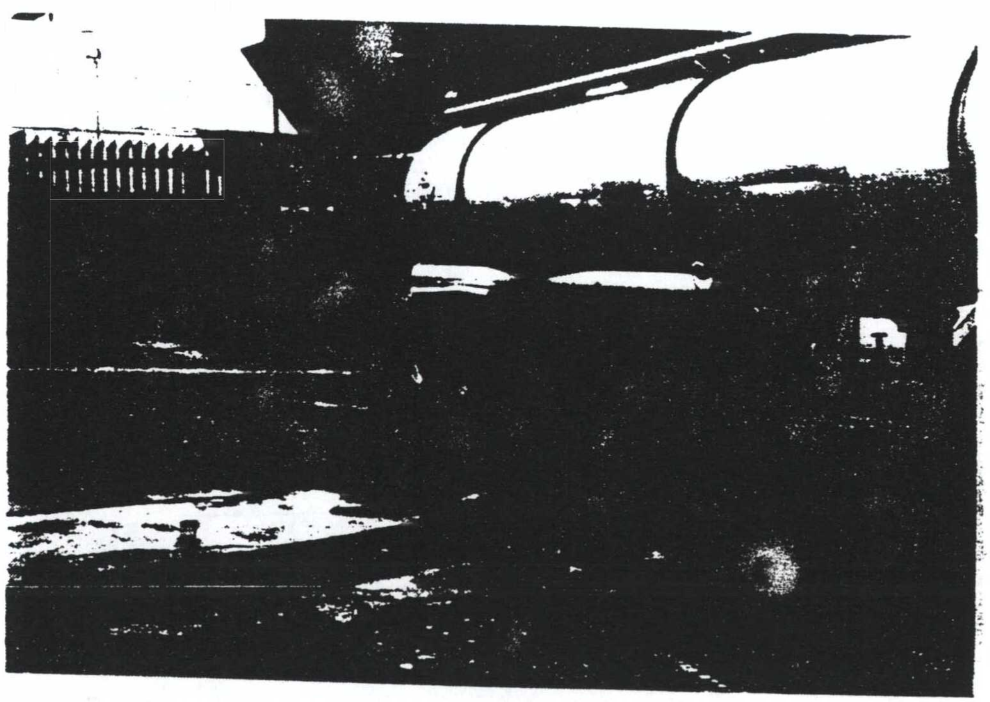

Photo 2. Oil/water separator area.

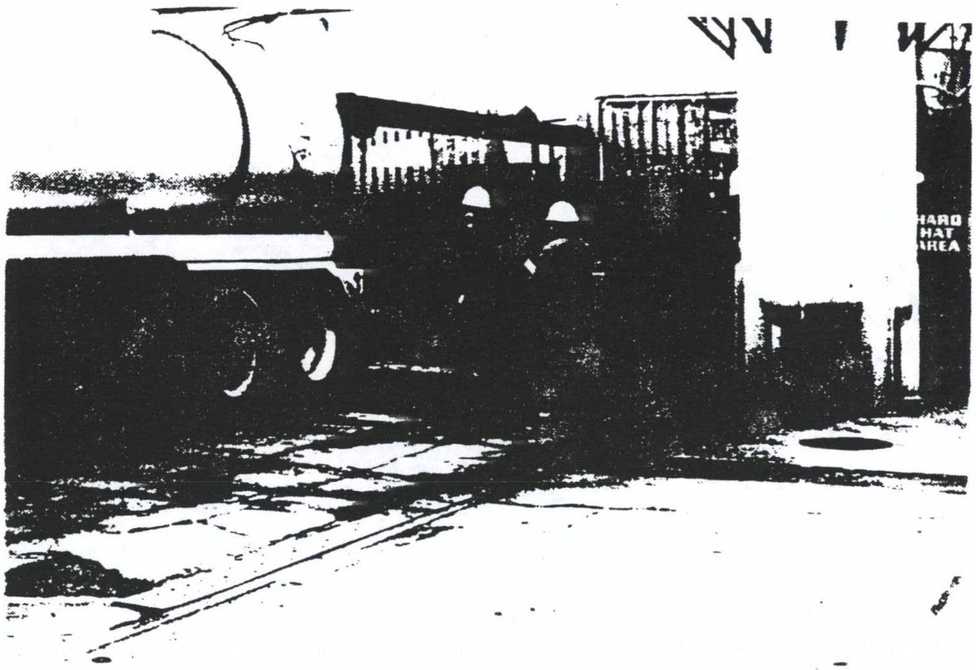

Photo 3. Oily wastewater truck off-loading area.

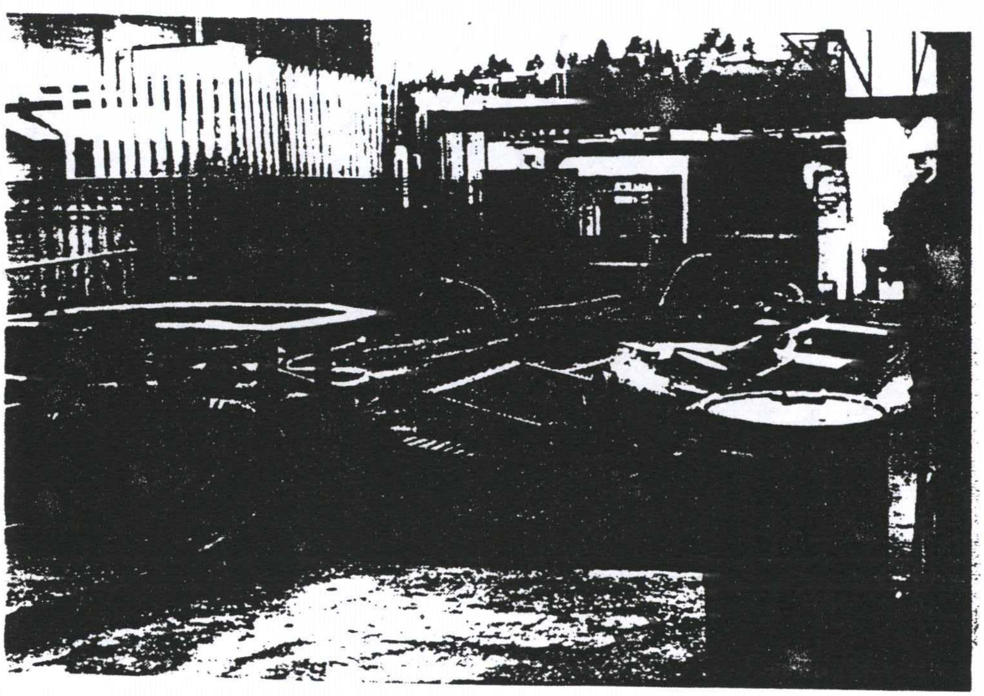

Photo 4. Oil/water separator.

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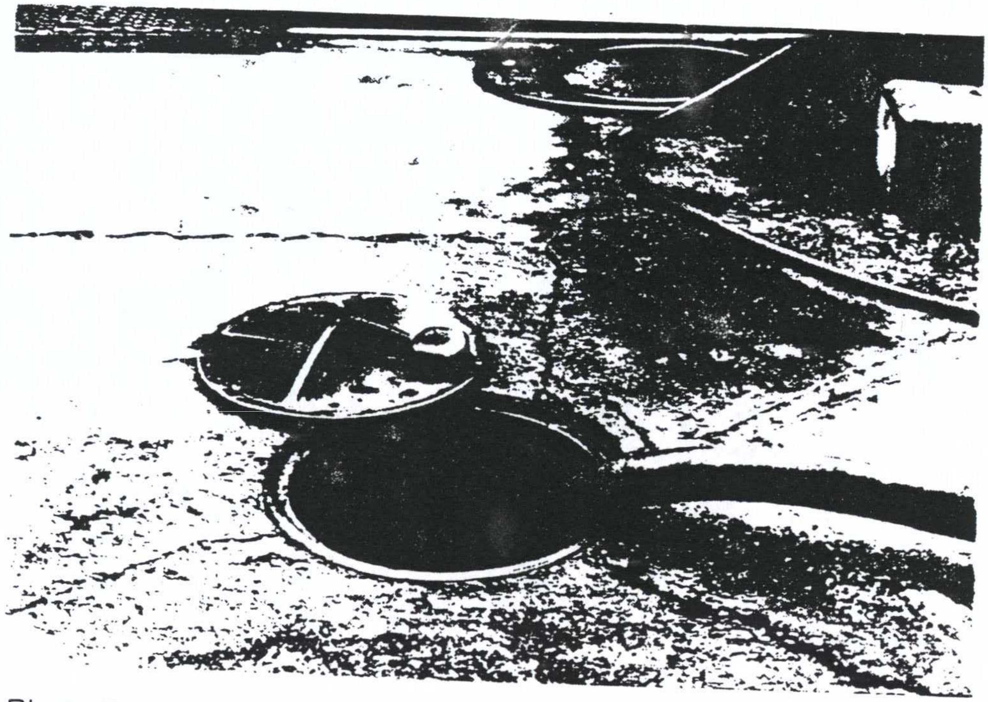

Photo 5. Storm water sump.

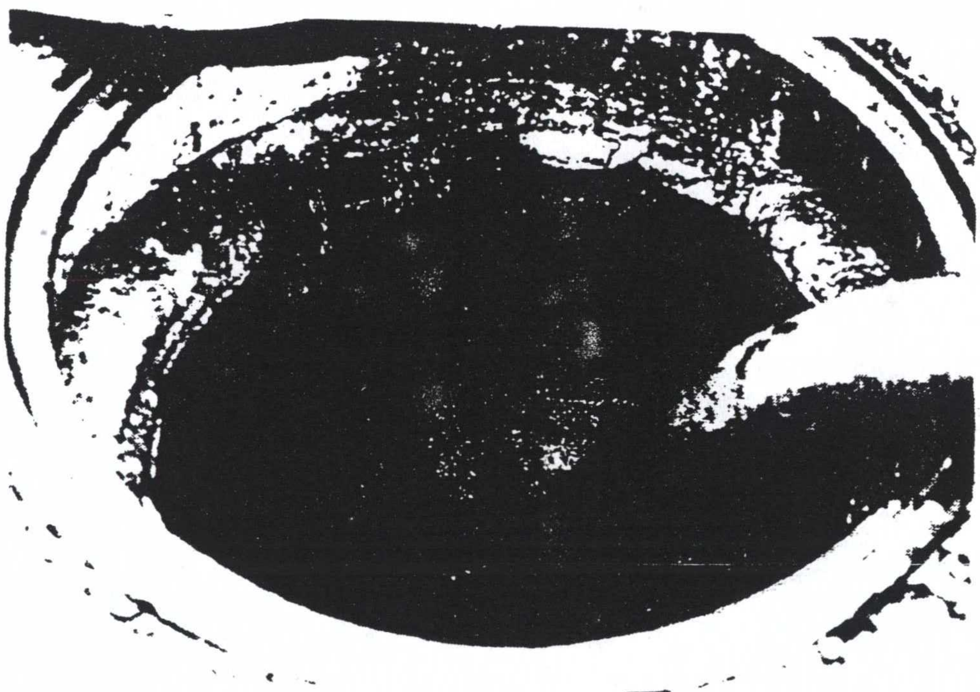

Photo 6. Storm water sump.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

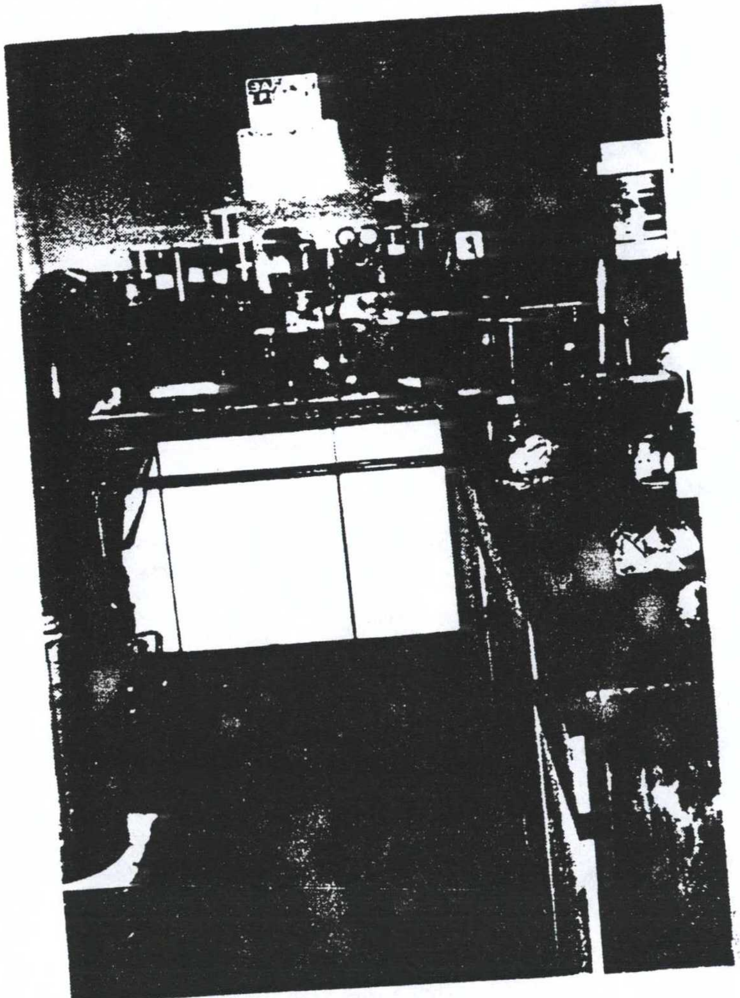

Figure 7. Operator testing laboratory.

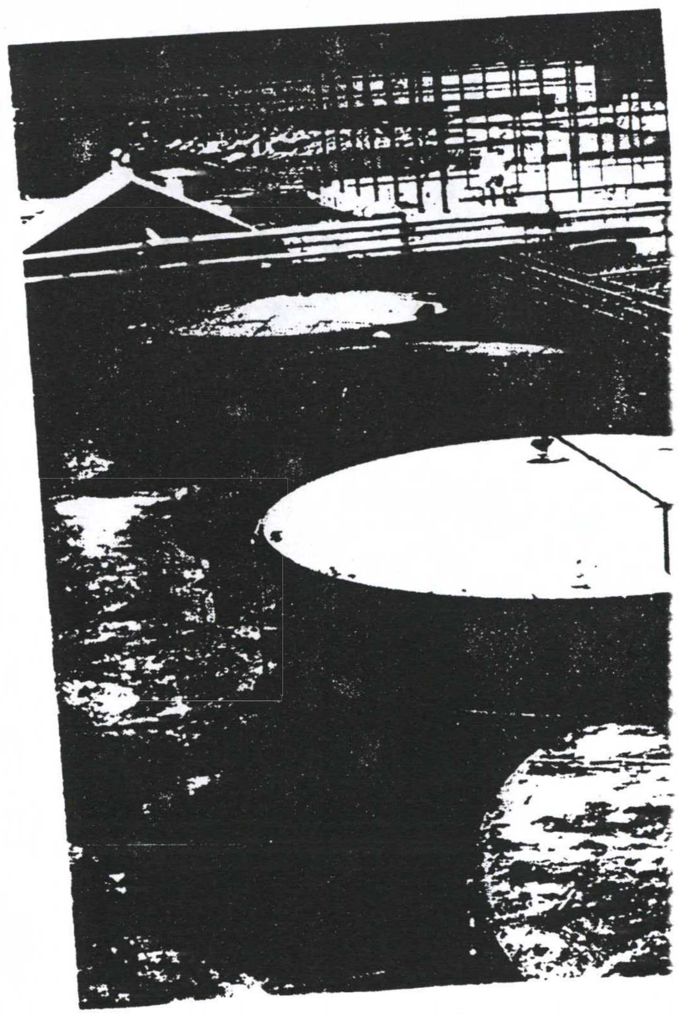

Figure 8. Small tank yard.

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VSI PHOTOGRAPHIC LOG
28 MARCH 1988

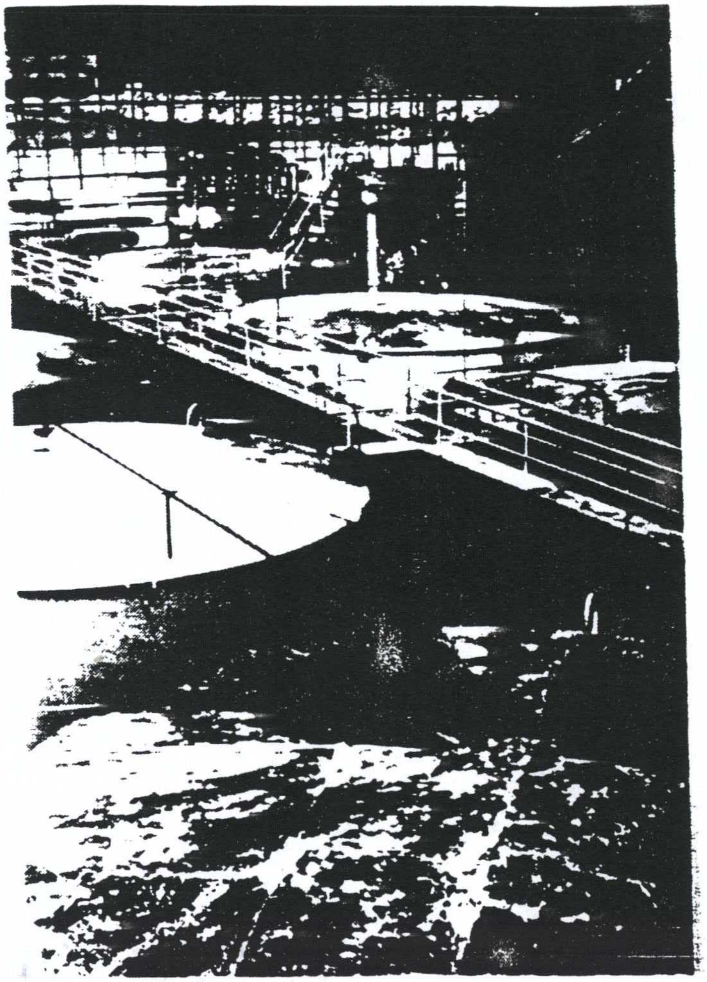

Figure 9. Small tank yard.

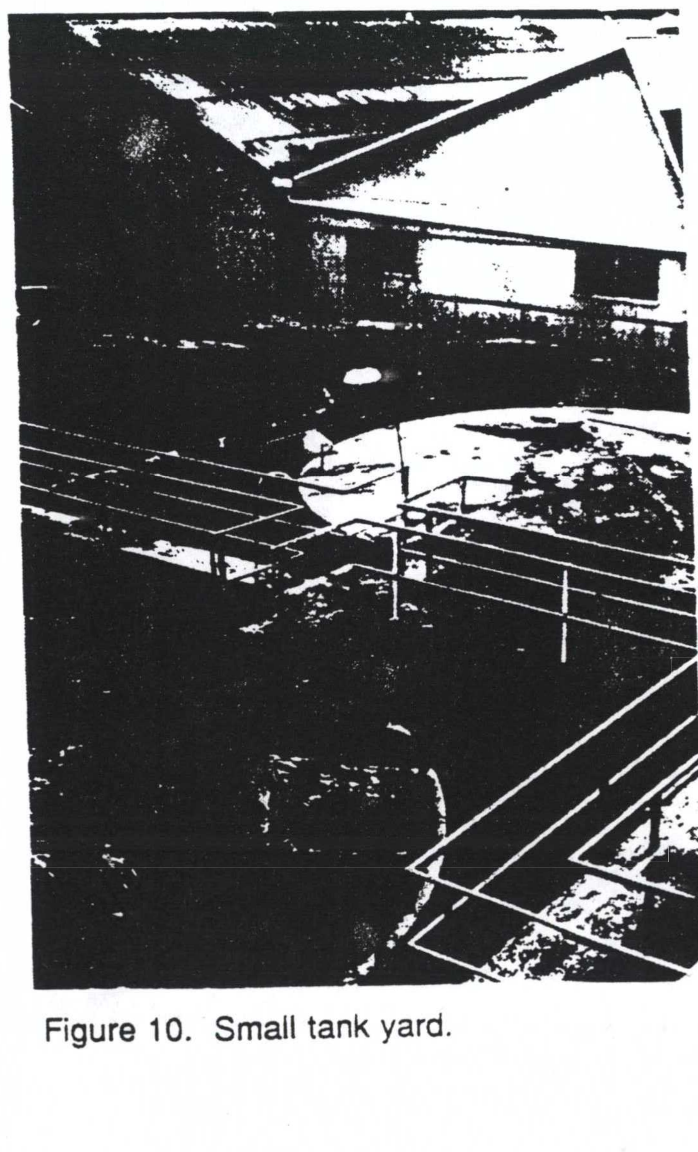

Figure 10. Small tank yard.

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VSI PHOTOGRAPHIC LOG
28 MARCH 1988

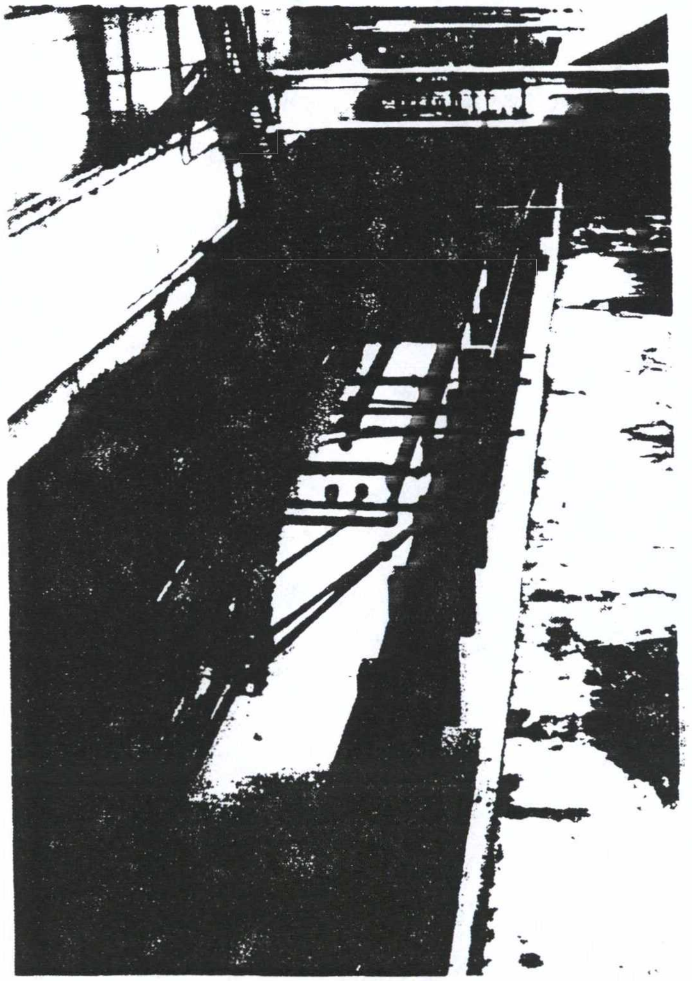

Photo 11. Pipe alley.

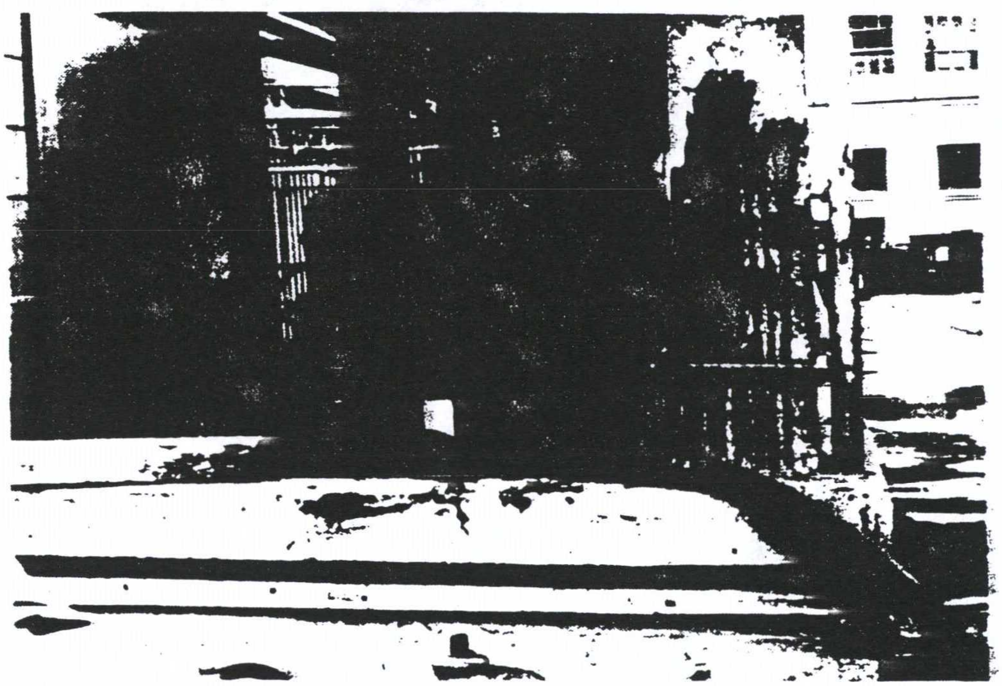

Photo 12. Sludge decanter/centrifuge.

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VSI PHOTOGRAPHIC LOG
28 MARCH 1988

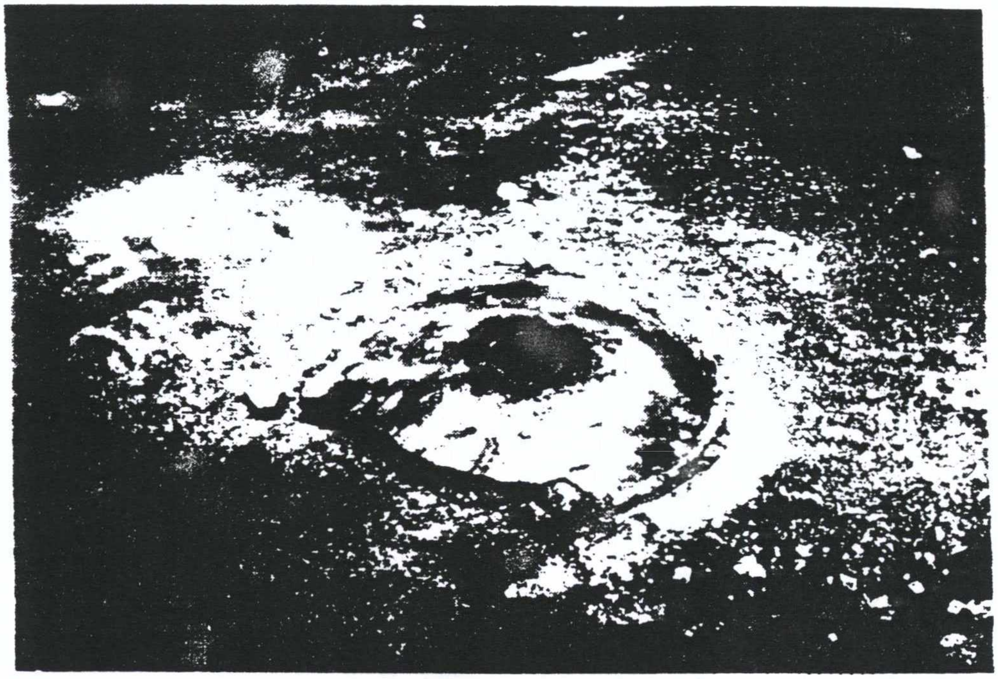

Photo 13. Groundwater well near Tank 13.

Photo 14. Marine diesel oil yard.

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VSI PHOTOGRAPHIC LOG
28 MARCH 1988

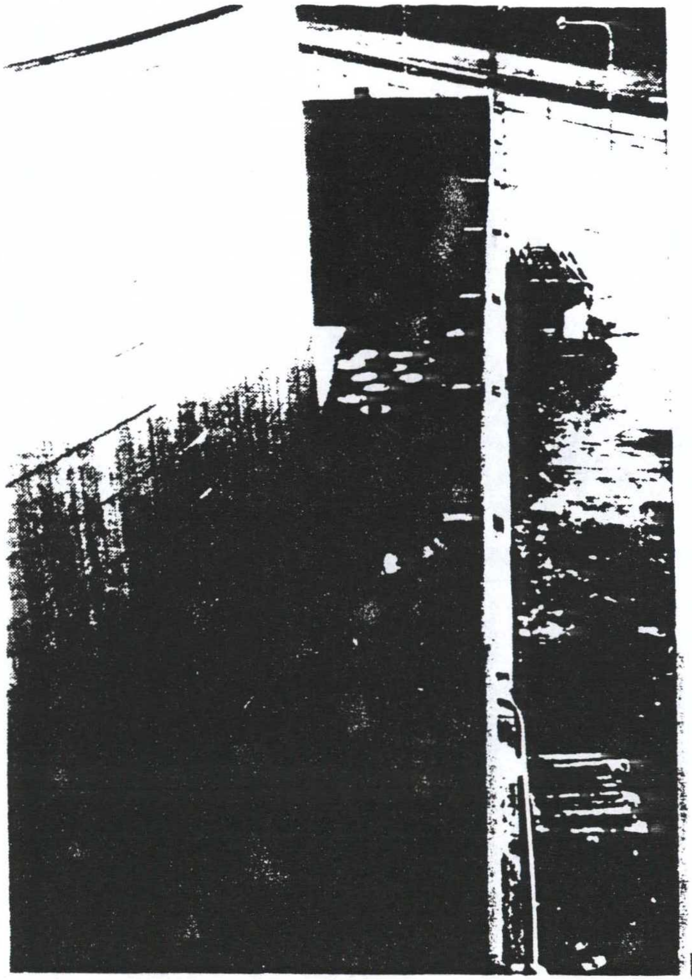

Photo 15. Marine diesel oil yard.

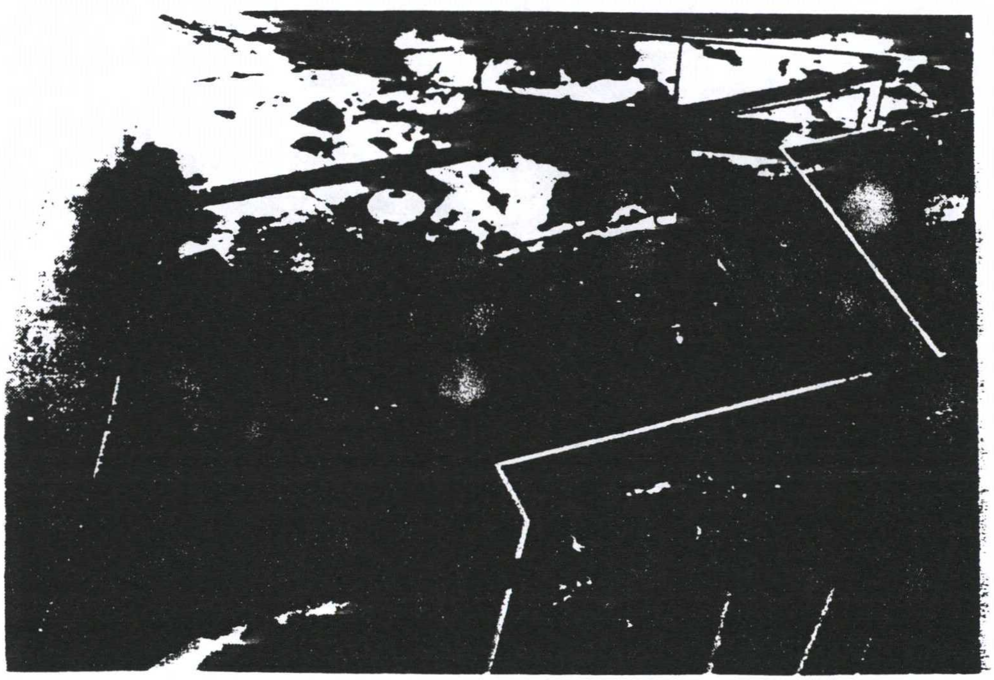

Photo 16. Wastewater sump in black oil yard.

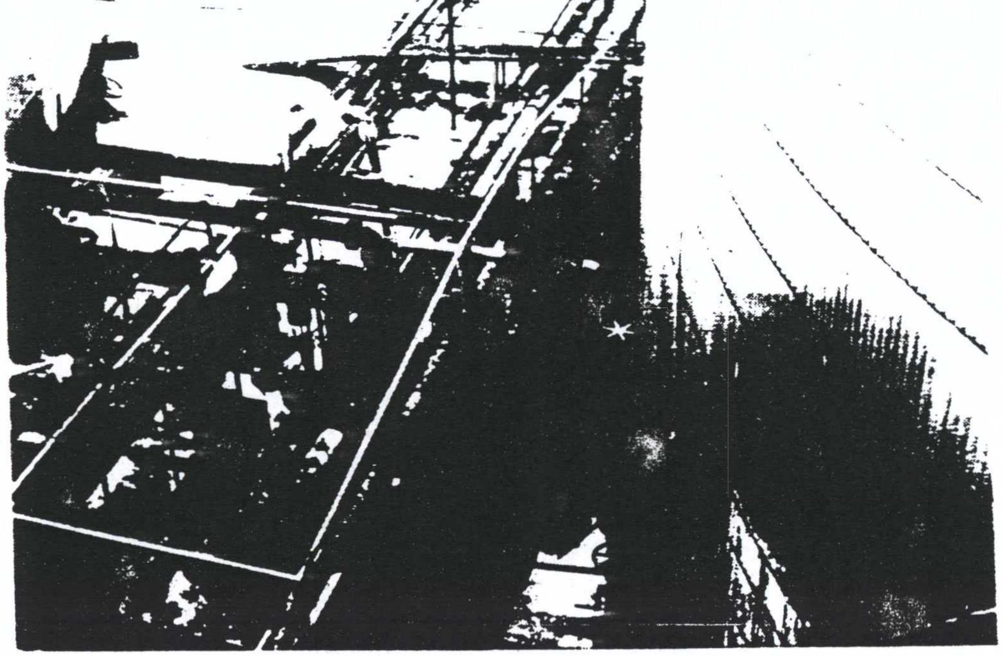

Photo 17. Wastewater sump in black oil yard.

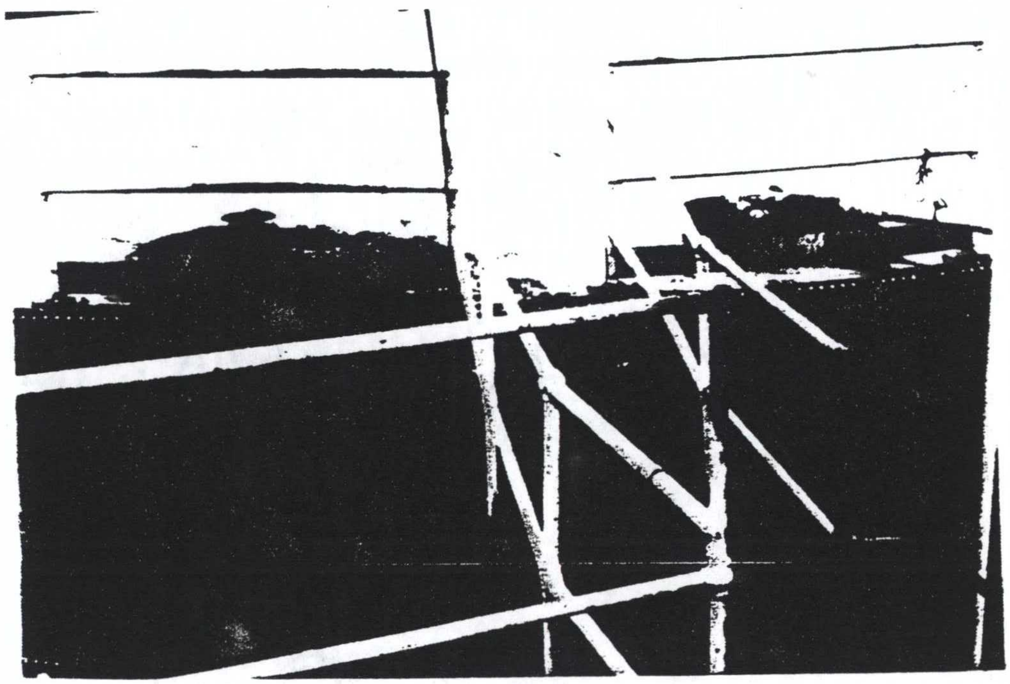

Photo 18. Oily wastewater Tank 90.

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28 MARCH 1988

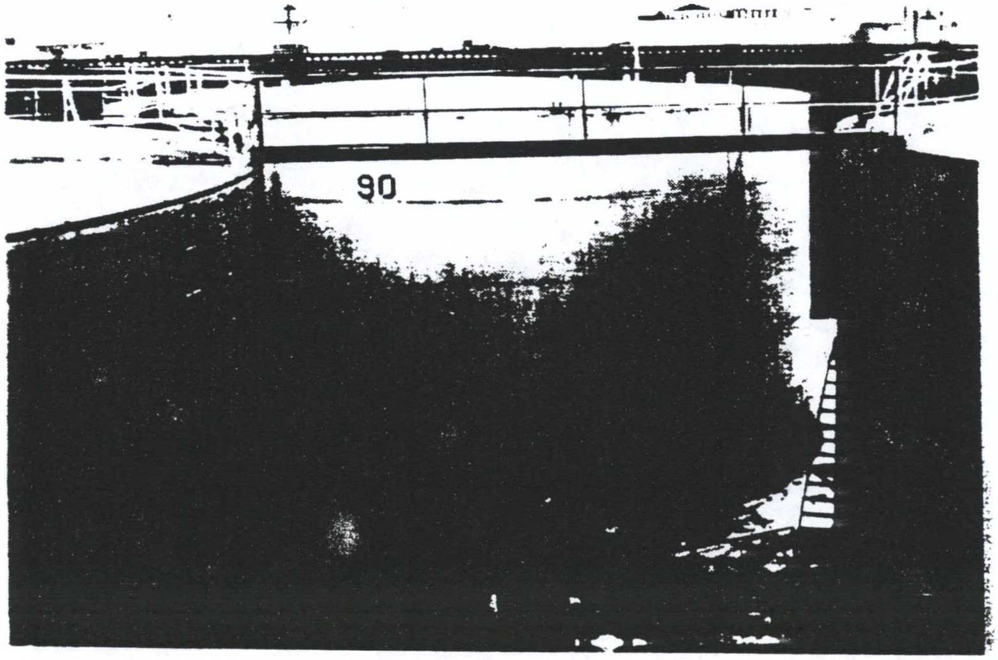

Photo 19. Oily wastewater Tank 90.

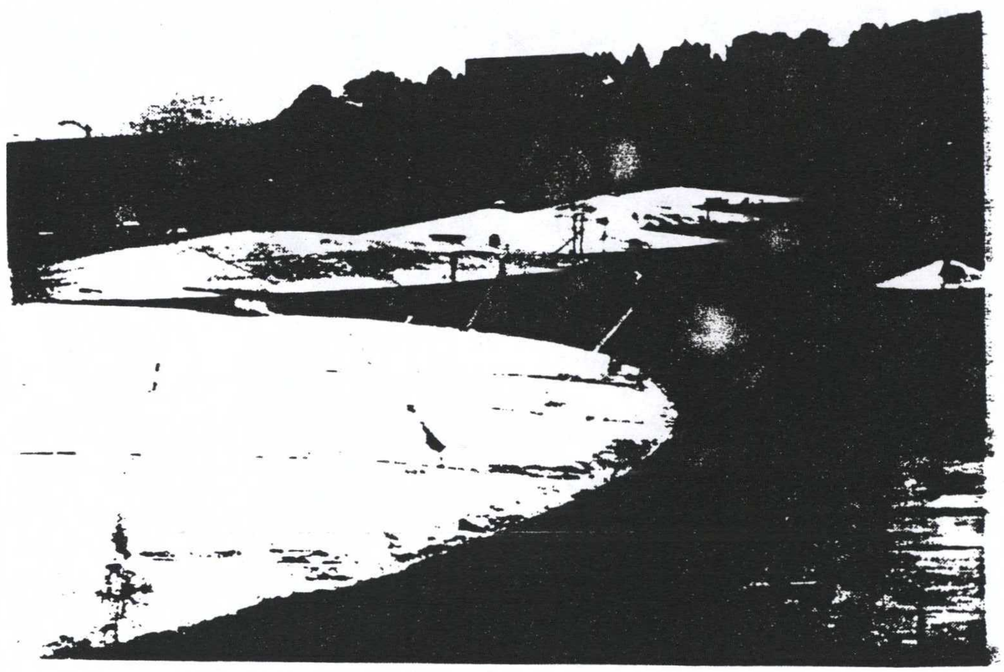

Photo 20. Marine diesel oil yard.

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VSI PHOTOGRAPHIC LOG
28 MARCH 1988

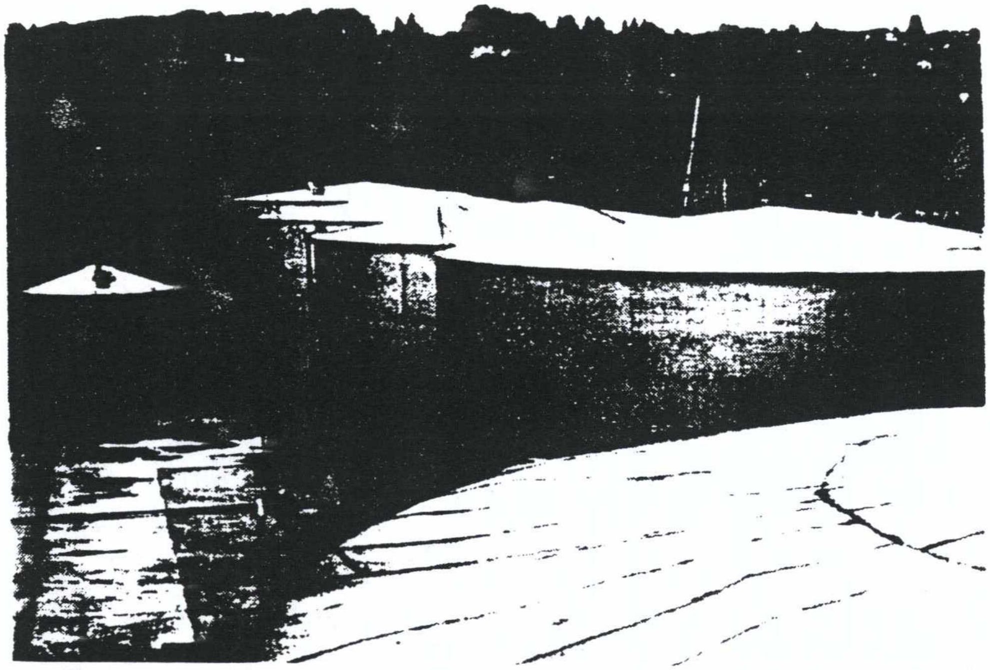


Photo 21. Marine diesel oil yard.

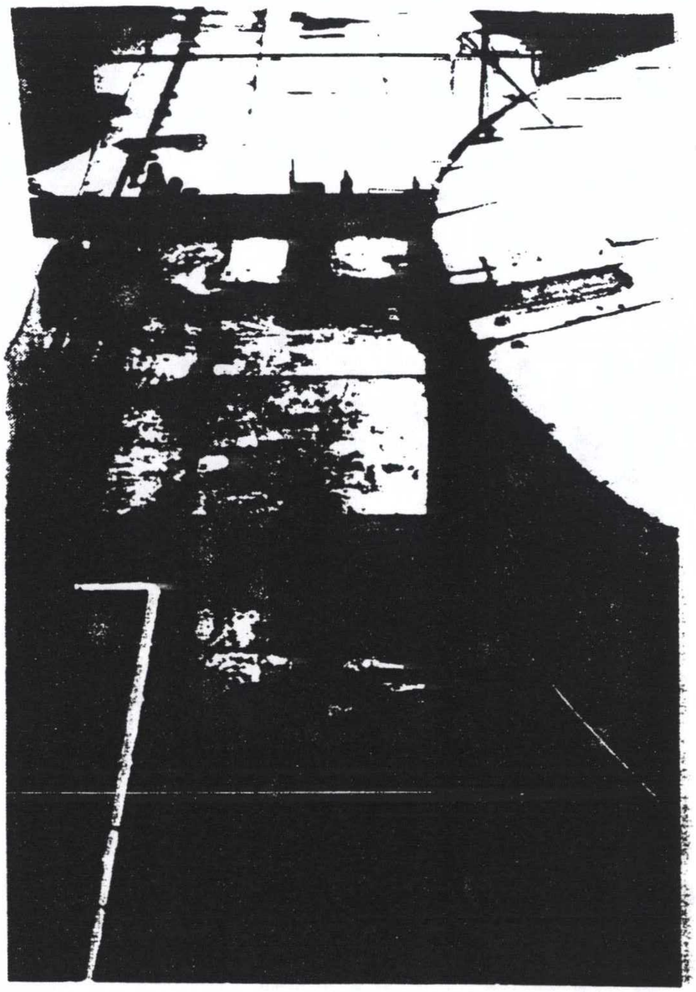


Photo 22. Marine diesel oil yard.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

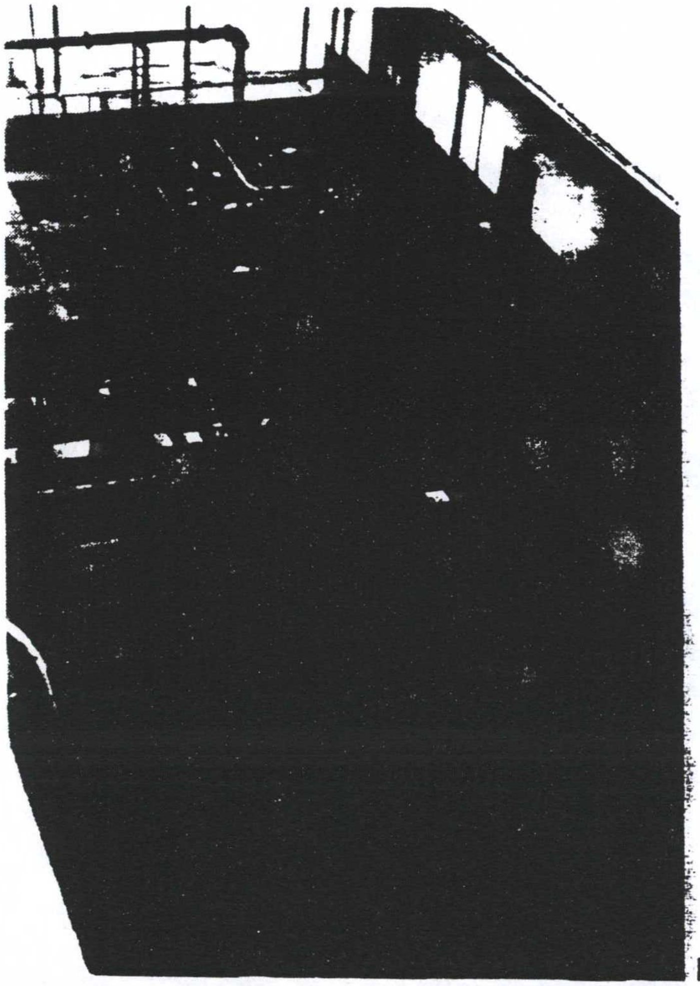


Photo 25. PANOCO sump area.

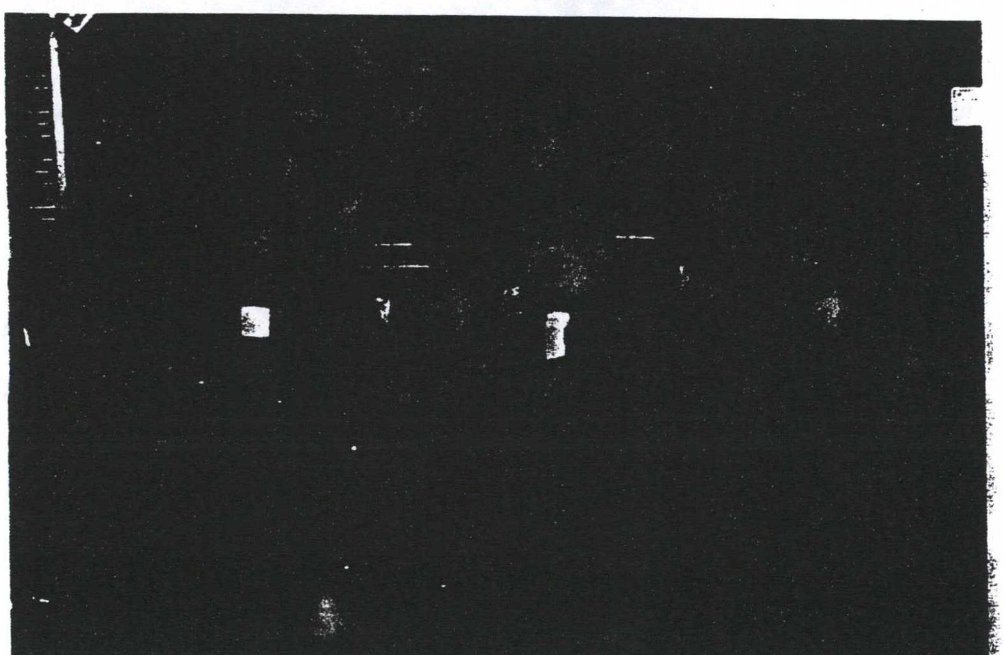


Photo 26. Hazardous waste container storage area.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

Photo 23. Waste coolant storage tanks.

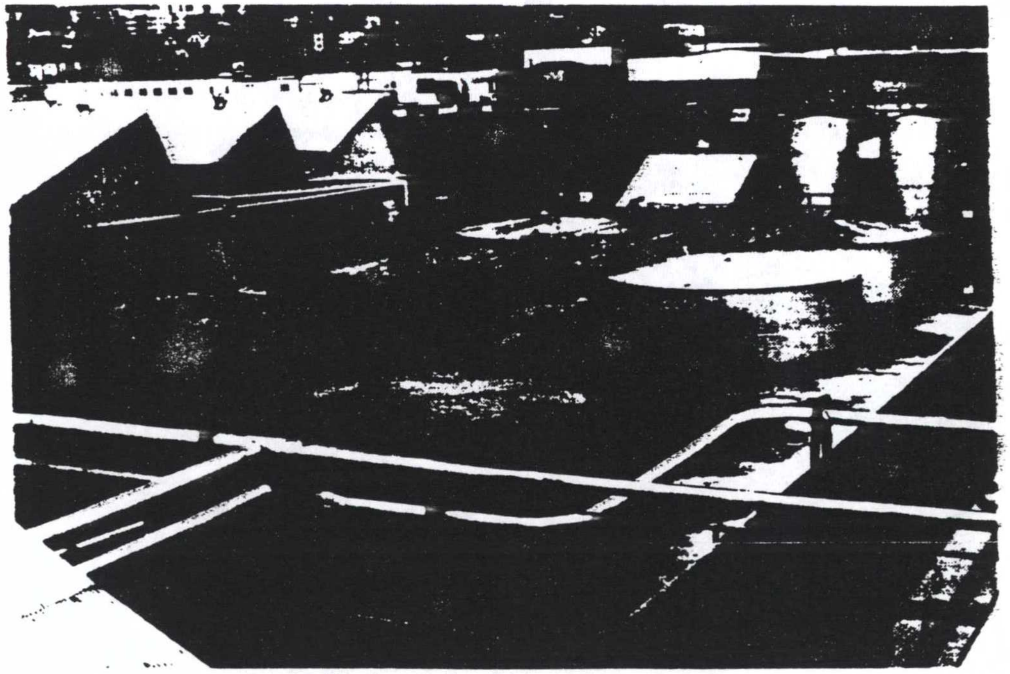


Photo 24. Small yard storage/treatment tanks.

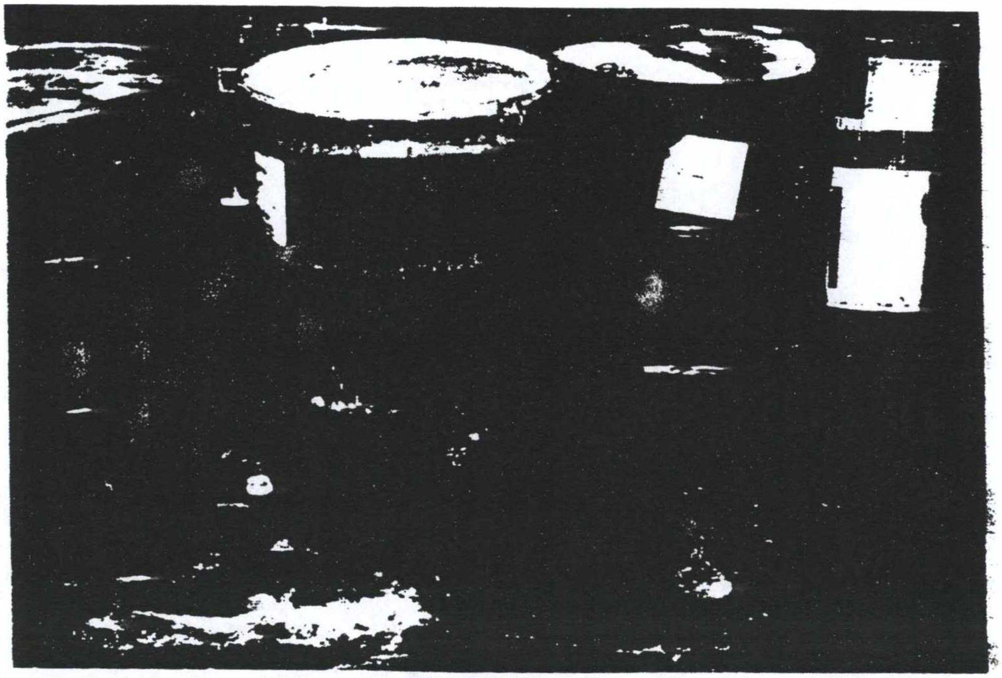


Photo 27. Leaking hazardous waste drum.

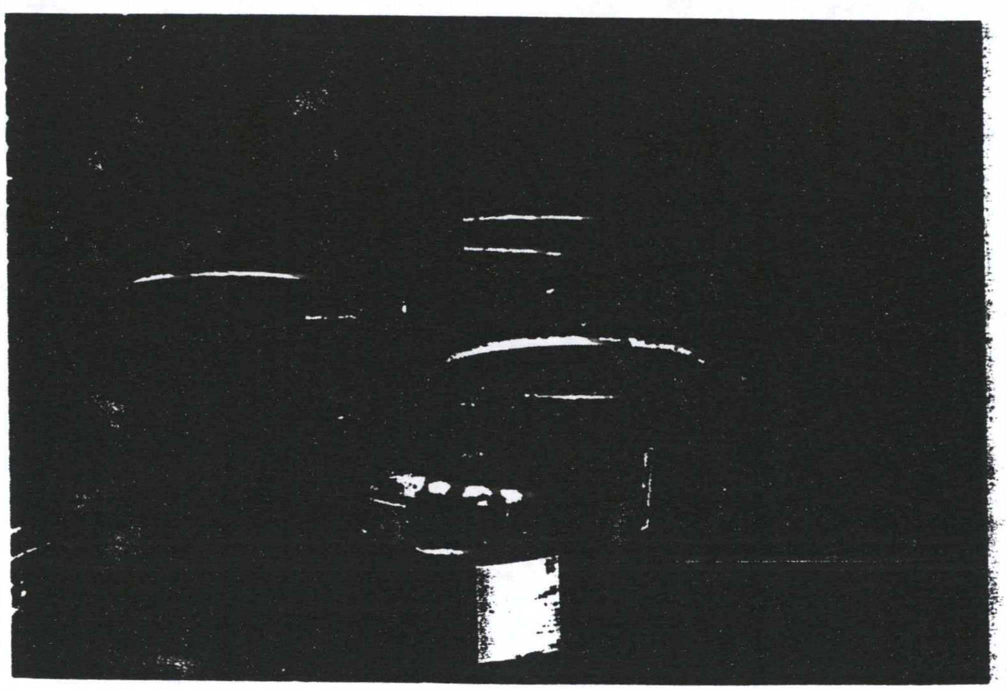


Photo 28. Hazardous waste storage drum.

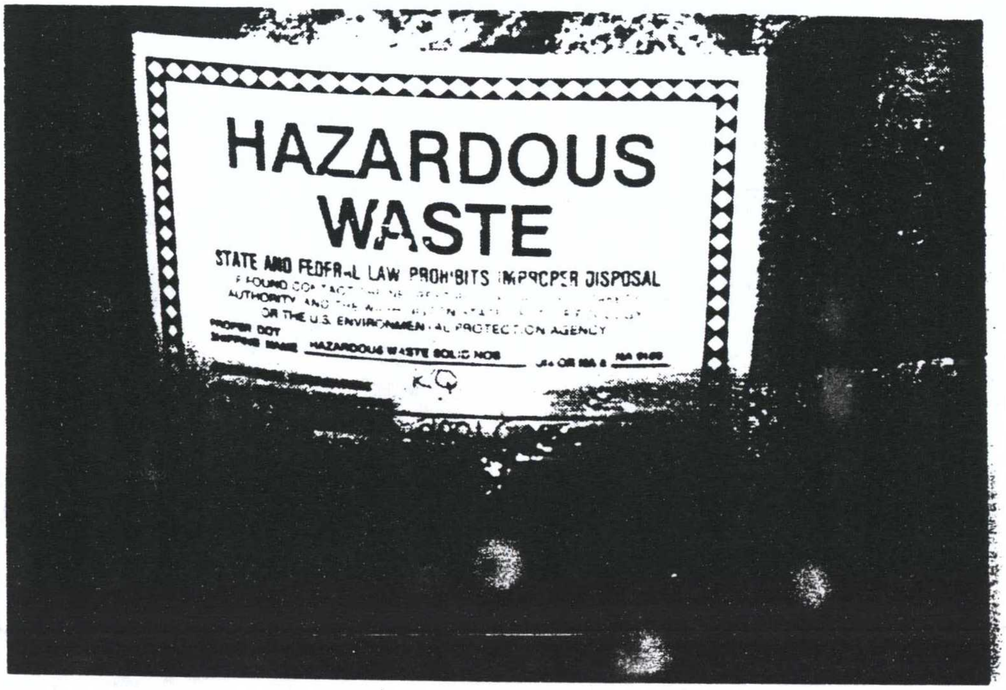


Photo 29. Label on hazardous waste drum.

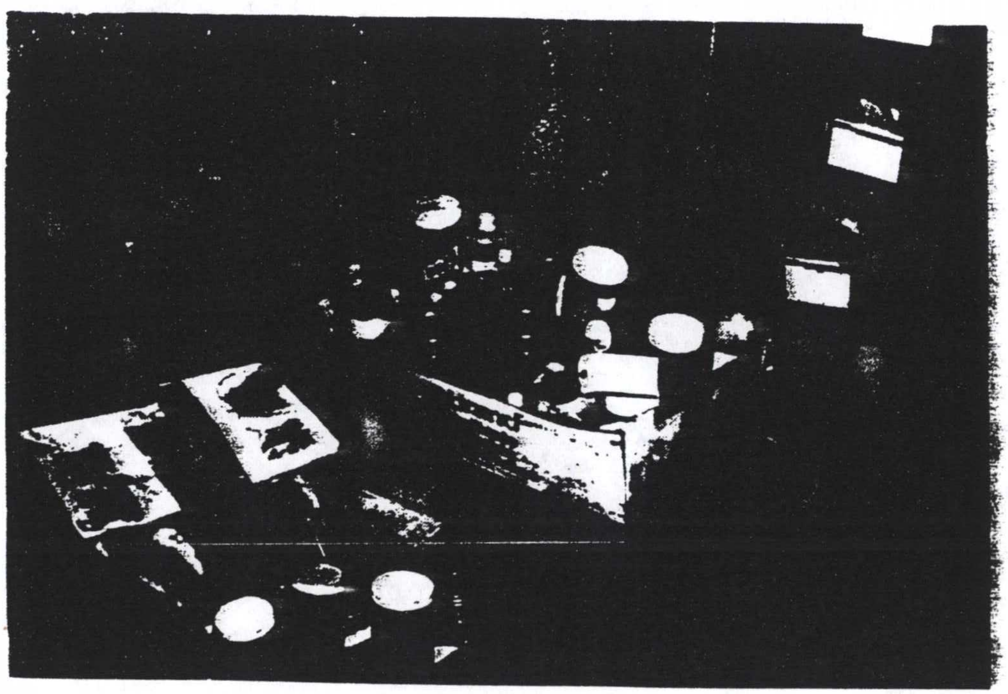


Photo 30. Sample storage area.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

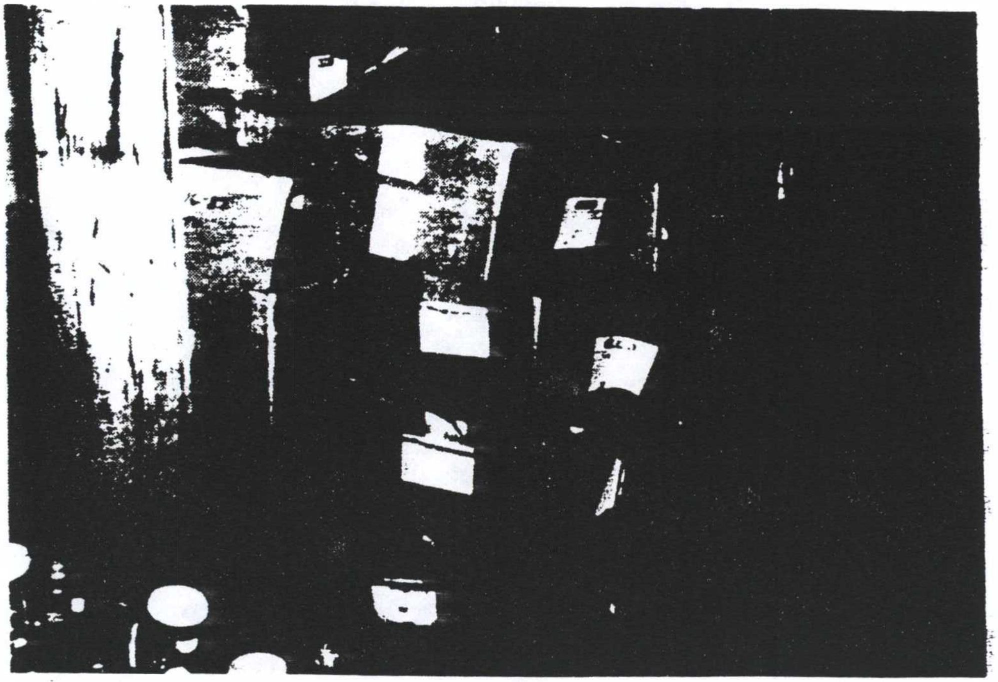


Photo 31. Sample storage area.

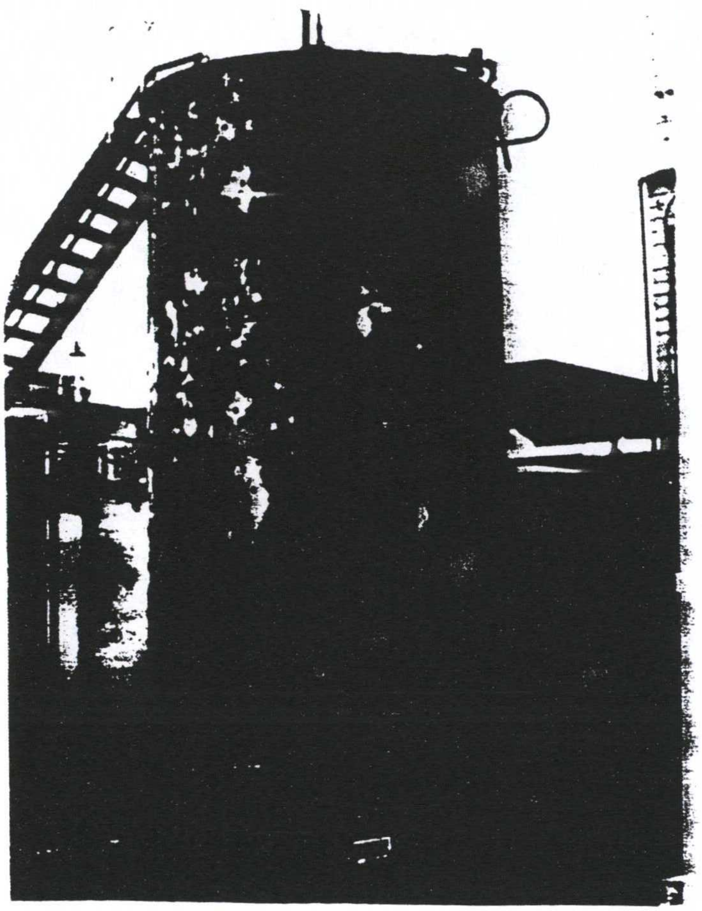


Photo 32. Coolant treatment
Tank 165.

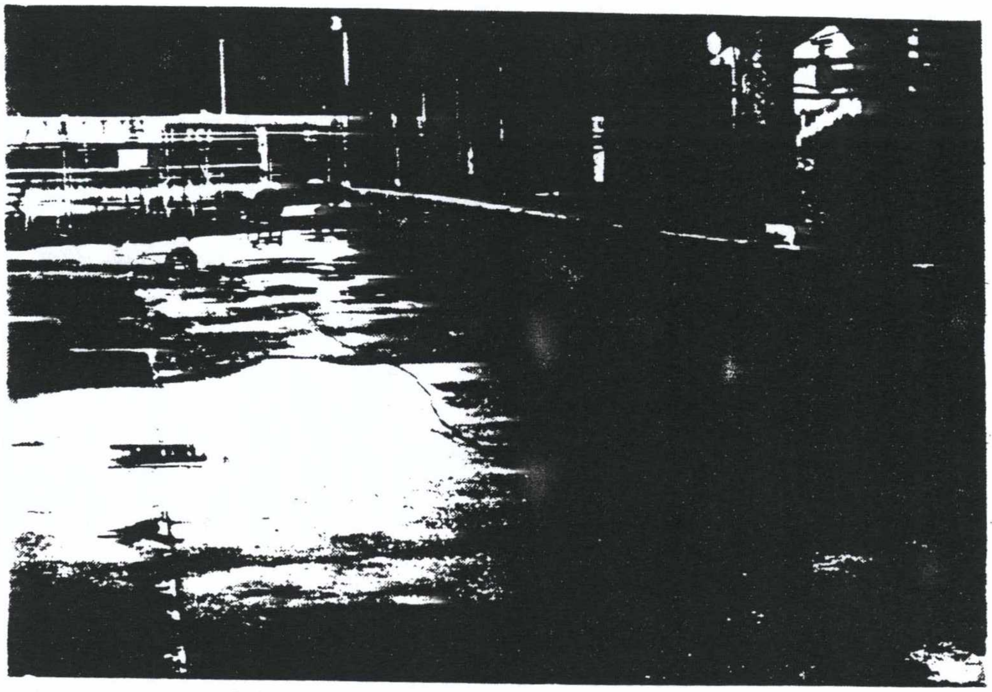


Photo 33. Former rec tank area.

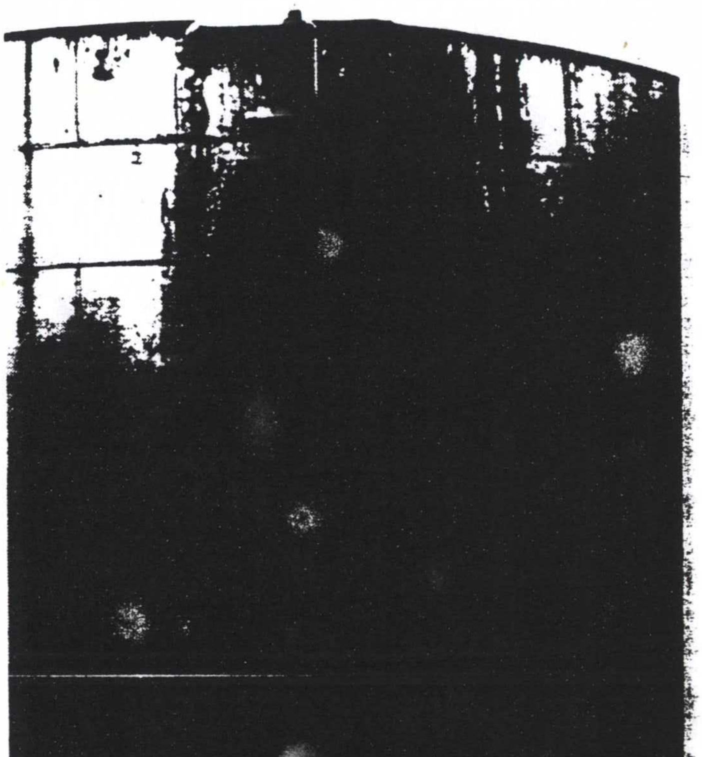


Photo 34. Tank 94.

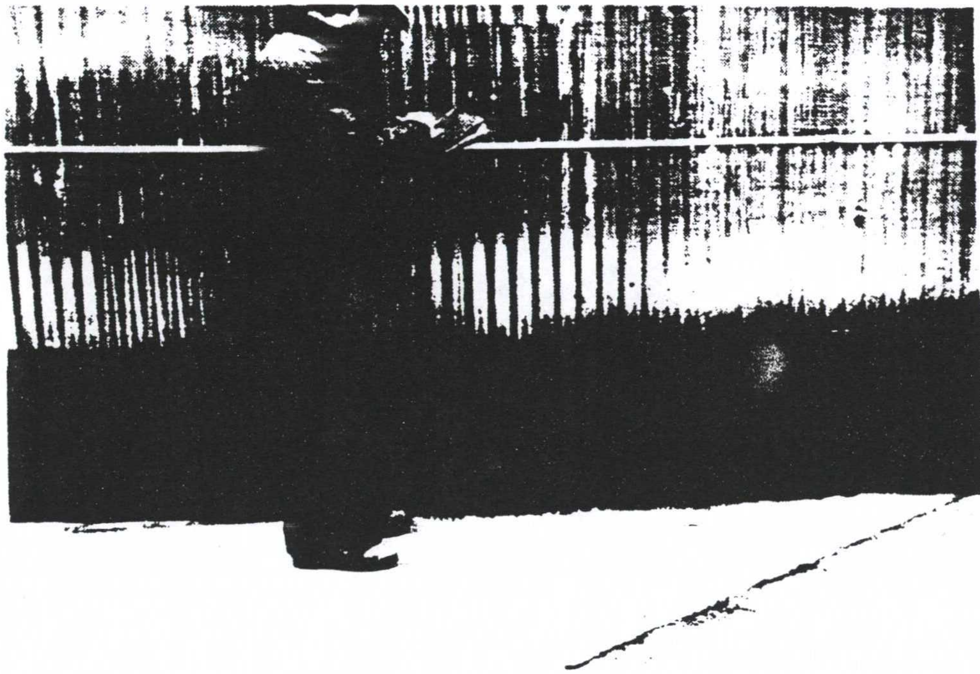


Photo 35. Spill area in marine diesel oil yard.

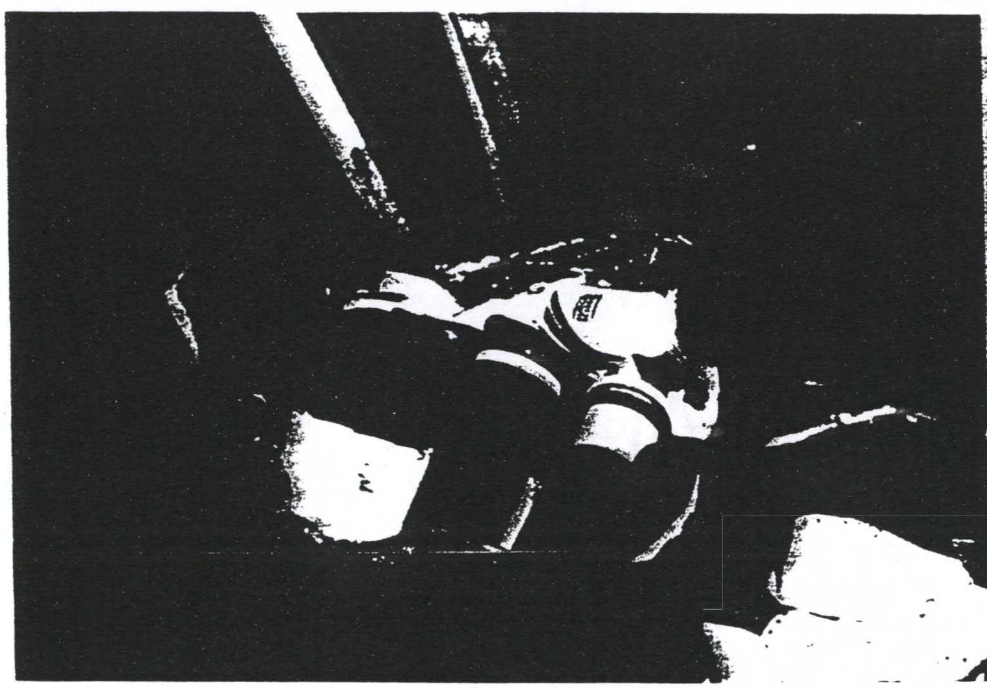


Photo 36. Discarded waste samples in garbage cans.

APPENDIX B

GROUNDWATER MONITORING WELL LOGS

Sweet, Edwards & Associates, Inc.

BORING LOG

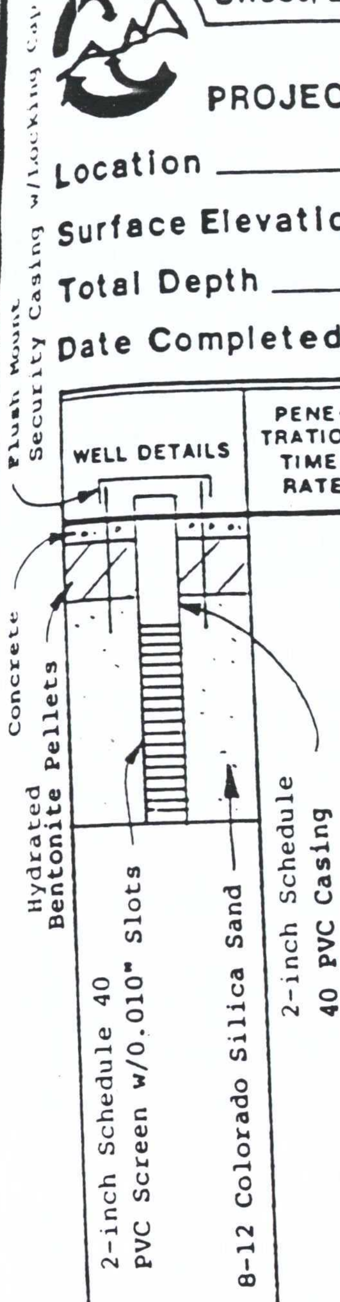
PROJECT Chempro, Pier 91 **Page** 1 **of** 1

Location See Figure 2.1 **Boring No.** CP-103A

Surface Elevation **Drilling Method** Cable Tool Rig with 6" Bit

Total Depth 15' **Drilled By** Holt Drilling

Date Completed 12/2/87 **Logged By** S. R. Henshaw

WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							See Boring Log CP-103-B	
		10					Terminated boring at 15' as/2/87	
		20						

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Location See Figure 2.1

Boring No. CP-103B

Surface Elevation

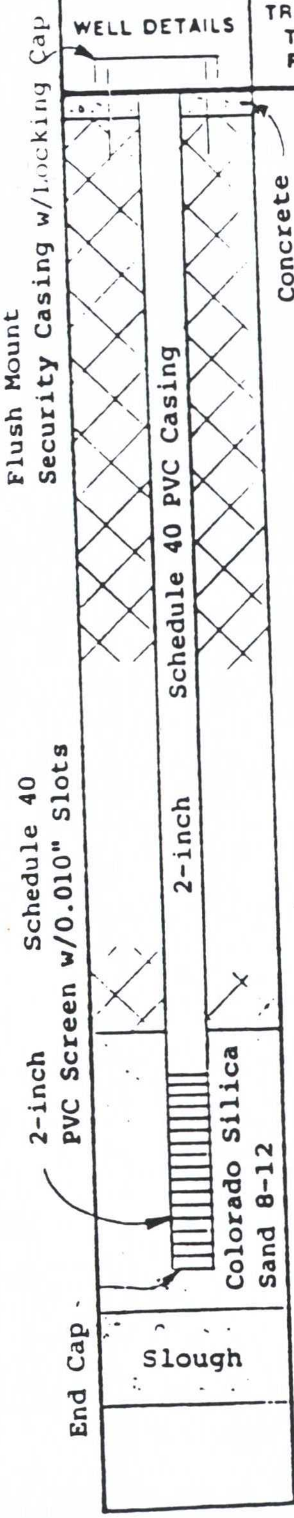
Drilling Method Cable Tool Rig with 6" Bit

Total Depth 69.5'

Drilled By Holt Drilling

Date Completed 12/2/87

Logged By S. R. Henshaw

WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
	--	10					0-15' GRAVELLY SAND, gray, medium to coarse grained, 20-30% gravel (basalt, quartzite) up to 4" in diameter, product observed at 10', saturated at 10'.	
		20	103-A	SPT			15-28' SILTY SAND, gray, medium grained, 15-25% silt, 5-10% subrounded gravel (basalt) up to 4" in diam. less than 5% shell fragm. product odor, saturated.	
		30	103-B	SPT			28-60' SAND, gray, medium grained, clean, less than 5% silt, poorly stratified, slight product odor, saturated.	
		40	103-C	SPT				
		50					50-51.5' strong H_2S odor, saturated.	
		60					60-66.5' SILTY SAND TO SANDY SILT	
		70	103-D	SPT			description on following page	

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Boring No. CP-103-B

WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
		70					Cont. gray, fine grained, alternating beds of silt and sand observed in drill cuttings. 15% shell fragements (some whole shells), 5% wood debris (peat), strong H_2S odor, saturated.	
		80						
		90					Terminated boring at 69.5' 12/2/87	

FILE COPY

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Page 1 of 1

Location See Figure 2.1

Boring No. CP-104A

Surface Elevation

Drilling Method Mobil B-56 with 4.25" I.. 7.5"O.D. Hollow Stem Auge

Total Depth 15'

Drilled By Tacoma Pump & Drilling

Date Completed 11/28/87

Logged By S. R. Henshaw

WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			No	Sample			0-10' SAND, medium grained, cuttings became wet at 6', gray.	
		10	101-A	SPT		GW	10-12' SILTY SAND, 10-20% subrounded gravel, less than 5% shell fragments, medium to coarse grained sand, gray, gravels are basalts, quartzite, metavolcanics, product odor, saturated.	
			No	Sample				
		20				SM	12-15' SILTY SAND, 5-10% pebble size sand, 60% medium sand, 30% silt, gray, strong product odor, saturated.	
							Terminated boring at 15' 11/28/87	

SEA-300-02a

Sweet, Edwards & Associates, Inc.

BORING LOG

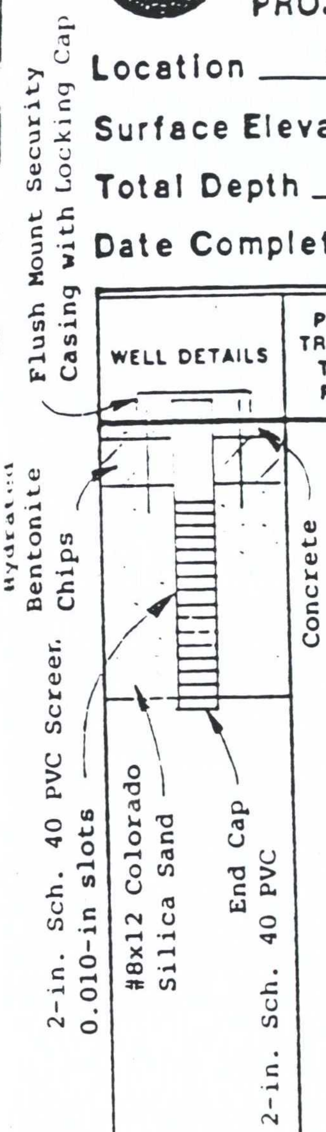
PROJECT Chempro, Pier 91 — **Page** 1 **of** 1

Location See Figure 2.1 — **Boring No.** CP-105-A

Surface Elevation ______ — **Drilling Method** Cable Tool Rig with 6" Bit

Total Depth 14' — **Drilled By** Holt Drilling

Date Completed 11/28/87 — **Logged By** S. R. Henshaw



WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							See Boring Log CP-105-B	
		10						
							Terminated boring at 14' 11/28/87	
		20						

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Page 1 of 1

Location See Figure 2.1

Boring No. 105B

Surface Elevation

Drilling Method 71 Speedster Cable Rig with 8" & 6" bits

Total Depth 58.5

Drilled By Holt Drilling

Date Completed 11/27/87

Logged By S. R. Henshaw

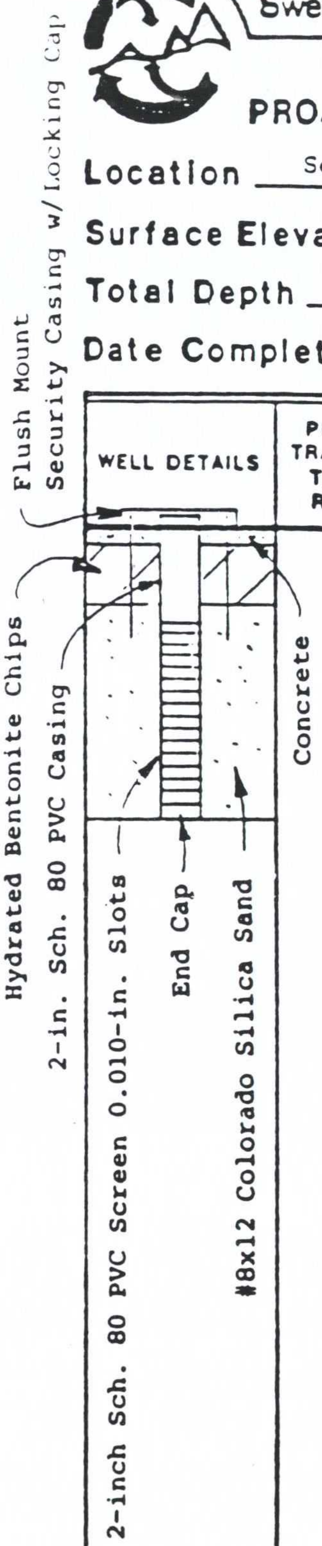
WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
Security Casing and Locking Cap							Concrete Pavement	
Bentonite Slurry; 2-inch PVC Well Casing			A	SPT		SM	2-30' SILTY SAND, medium brown, medium grained, poorly sorted, some gravel, shell fragments, poorly consolidated, moist. ---light gray to black, subrounded gravel to 2" diameter, wood debris, trace shell fragments, saturated.	
		10	B	BAIL				
			C	SPT				
Natural Material		20	D	SPT		SW	21-30' GRAVELLY SAND, dark gray to black, fine to coarse sand, gravels to 2" diameter, saturated.	
Bentonite Chips		30	E	SPT		SM	30-44' SILTY SAND, medium gray, fine to medium grained, some subrounded gravel, some shell fragments, hydrogen sulfide odor, saturated.	
#8x12 Colorado Silica Sand; 2-inch PVC Well Screen w/0.010-inch Slots		40				ML	44-58.5' SILT, brown to black, some medium sand, some wood debris, saturated	
Natural Material		50	F	SPT				
		60					Terminated boring at 58.5' 11/27/87	

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91 **Page** 1 **of** 1

Location See Figure 2.1	**Boring No.** CP-106
Surface Elevation	**Drilling Method** Mobil B-56 with 4.25" I.D. 7.5"O.D. Hollow Stem Auge
Total Depth 15'	**Drilled By** Tacoma Pump & Drilling
Date Completed 11/28/87	**Logged By** S. R. Henshaw



WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							Concrete Pavement	
							2-15' SAND, dark gray, fine to medium grained, less than 5% shell fragments, 5-10% silt, product odor, saturated.	
		10	106-A	SPT				
							12-15' increasing gravels up to 4".	
		20	No	Sample				
							Terminated boring at 15' 11/28/87	

Table 3.1

Summary of Water Levels

Well Number	Elevation Top of PVC*	Depth to Water 12/14/87	Depth to Water 12/4/87	Depth to Water 12/5/87
CP-103-A	11.19	--	6.35	6.41
CP-103-B	11.24	--	7.85	8.02
CP-104-A	11.37	--	6.75	5.69
CP-105-A	11.88	6.40	5.78	5.78
CP-105-B	11.90	6.75	6.09	6.00
CP-106-A	12.01	--	5.45	5.49
B-101	--	--	6.03	--
B-102	--	--	8.00**	--

* Elevation above mean sea level.

** Well casing broken.

APPENDIX C

CHEMPRO GENERATOR'S WASTE MATERIAL PROFILE DATA

APPENDIX C

WASTE MATERIAL PROFILE STANDARDS

Physical state	solid
Free liquids	No
Specific Gravity	0.8-1.4
Flashpoint	>140°F

Arsenic	0-1,000 ppm
Barium	0-5 ppm
Cadmium	0-10 ppm
Chromium	0-10 ppm
Mercury	0-100 ppm
Lead	0-10,000 ppm
Chromium (+6)	0-1,000 ppm
Selenium	0-500 ppm
Silver	0-500 ppm
Copper	0-10,000 ppm
Nickel	0-10 ppm
Zinc	0-10 ppm
Thallium	0-100 ppm

APPENDIX B

POSSIBLE SOLID WASTE MANAGEMENT UNITS CLOSED PRIOR TO AND DURING CHEMICAL PROCESSORS, INC. OPERATION

(Chempro 1988)

Table 1 - Pier 91 Facility: Possible Solid Waste Management Units Closed Prior To Chemical Processors. Inc. Operations

UNIT NO. DESCRIPTION	PROCESS USE ACTIVE PERIODS	PRODUCT OR DANGEROUS WASTE CONTAINED	(GALLONS) CAPACITY	DIMENSIONS	MATERIAL OF CONSTRUCTION	STRUCTURE TYPE	COMMENTS	KNOWN RELEASES
Building 17: Drum Cleaning Building	1926 - 1977: Exact use unknown. Possibly inactive. ?-1977. Adjacent tank systems used for petroleum refining in 1920's; for oil storage and reclamation since 1940s.	Unknown	Unknown	Approx. 100 x 25' (2715 square feet)	Metal	Building	Shed roof extension (approx. 37' x 23', open on 3 sides) added to SE side of building in approx. 1950. Building and extension dismantled 1977.	None
Tanks 340 and 341	1926 to ?: Use unknown. Possibly inactive or removed between 1936 and 1977.	Unknown	Unknown	10' x 20	Unknown	Aboveground tank	Originally outdoors. Enclosed between 1936 and 1946 when Boiler House (Bldg 23) was expanded. Tanks removed prior to 1977, when Boiler House (Bldg 23) was dismantled.	None
Tank 1530	1926 - approx. 1936: agitator tank.	Unknown	63,000	Unknown	Unknown	Aboveground tank	Removed by 1936.	None
Tanks 119-126	Approx. 1936 - approx. 1948: use unknown.	Unknown	Unknown	Unknown	Unknown	Elevated aboveground tanks	Formerly designated tanks 50 through 57 (at same location) Removed approx. 1948.	None
Oil Barrel Drain Pit	Approx. 1950 - ?: oil barrel drain pit.	Unknown	Unknown	Approx. 19 L x 3 1/2 W x ? D	Presumeably concrete	Belowground tank, covered with shed roof	Removal date unknown. Shed roof and adjacent building dismantled in 1977.	None

Table 1 - Pier 91 Facility: Possible Solid Waste Management Units Closed Prior To Chemical Processors, Inc. Operations

UNIT NO. DESCRIPTION	PROCESS USE ACTIVE PERIODS	PRODUCT OR DANGEROUS WASTE CONTAINED	(GALLONS) CAPACITY	DIMENSIONS	MATERIAL OF CONSTRUCTION	STRUCTURE TYPE	COMMENTS	KNOWN RELEASES
Tanks 7 and 8	Approx. 1944 (or earlier) - ?: lube oil cleaning (water removal). Inactive 1971 (or earlier) to present.	Lube oil	Approx. 1,200	Appx. 8'L x 12'D with 3' vented cone-topped extension apparently added later	Steel	Elevated aboveground tanks	Labeled as kettles in 1944 archive drawing. Small lube oil centrifuge formerly located adjacent to tanks was disconnected in mid to late 1970s, and is presently stored elsewhere in warehouse. Tank piping, fittings and valves were disconnected and removed at that time. Drip pans are still present beneath the tanks.	None

Table 2 - Pier 91 Facility: Solid Waste Managent Units Closed During Chemical Processors, Inc. Operations

UNIT NO. DESCRIPTION	PROCESS USE ACTIVE PERIODS	PRODUCT OR DANGEROUS WASTE CONTAINED	(GALLONS) CAPACITY	DIMENSIONS	MATERIAL OF CONSTRUCTION	STRUCTURE TYPE	COMMENTS	KNOWN RELEASES
Tank 118	1926 - 1940s: Use unknown. 1940s - 1050s: Storage. 1950s - 1977: Storage. 1977 - July 1986: Inactive.	Unknown. Lube oil. Possibly contained corrosives. N/A	15,500	24'H x approx. 10'D	Carbon Steel	Aboveground tank	Decontaminated, certified and scrapped July 1986.	None
Wastewater Treatment Tanks (2)	1979 - 1982: Wastewater treatment.	Wastewater with low chrome phenol concentrations, and emulsified wastewater.	Two tanks each 6,000 to 8,000	Approx. 4 H x 10 D each	Presumed steel and plastic frame with appx. 20 ml vinyl liner.	Aboveground tanks, open-top	Contents received from tanker trucks, and sent to other tanks on site after treatment. Dismantled and removed from site sometime prior to 1983. Cut up, drummed, and sent to an approved offsite disposal facility at that time.	None
Coolant Treatment Tank	Mid 1980 - Early 1981: Water in tank heated with steam coils; drums of asphalt/tar placed on rack in water to liquefy contents prior to transfer to other tanks. Early 1981 - March	Drums of asphalt tar. Coolants	4,500	30'L x 6 to 8 W x 4 H	Steel	Aboveground tank: used, rectangular, open top	Located outside south warehouse wall 1980-1984. Relocated approx. 15' southwest outside tank system wall in 1984 and used at this location until 1988. Decontaminated, certified, and scrapped March 1988.	None

Pier 91 Facility: Solid Waste Managent Units Closed During Chemical Processors, Inc. Operations

PRODUCT OR DANGEROUS WASTE CONTAINED	(GALLONS) CAPACITY	DIMENSIONS	MATERIAL OF CONSTRUCTION	STRUCTURE TYPE	COMMENTS	KNOWN RELEASES
Wastewater requiring clarification.	Approx. 4,900	30'L x 6' to 8'W x 3.5'H	Same as above	Same as above	Same as above.	None

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APPENDIX C

KNOWN RELEASES TO THE ENVIRONMENT PRIOR TO AND DURING CHEMICAL PROCESSORS, INC. OPERATIONS UP UNTIL JULY 5, 1988

(Chempro 1988)

Table 3 - Pier 91 Facility: Known Releases to the Environment

IIT	DATE OF RELEASE	TYPE OF PRODUCT OR WASTE RELEASED (a)	APPROX. QTY/ VOL. RELEASED	MEDIA	NATURE OF RELEASE	HOW RELEASE DETECTED	AGENCY NOTIFIED	MIGRATION PATH	ACTIONS TAKEN
nk 94	07-05-80	Oil	63,000 - 113,400 gal.	Soil	Operator error: valve to Tank 94 left open during transfer from Tank [illegible] to Tank 91. Tank 94 overflowed.	Visual observation.	Unknown	Released to gravel-covered unpaved area within diked yard.	Documented plans were to recover spilled oil off the ground and direct it to an on site tank for reclamation. Soil piles in the yard (possibly from this spill; possibly from subsequent spills) and routine cleanup) were removed from the area in 1986 and 1987. Analytical results from soil pile sampling in July 1986 indicated that the soil was non-hazardous (see Section 6.0 and Attachment A). The tank system yard was fully paved in 1986.
Tracks. West Warehouse dg 19)	Dec 77 or Jan 80	Bunker fuel.	Approx. 5,000 to 10,000 gallons	Asphalt and soil	Steam pump hose broke free from rail car valve, during unloading.	Visual observation.	Unknown	Release spread under warehouse (Building 19), along RR tracks, and into storm drains in immediate vicinity.	Released material pumped to on-site tank. Residue removed with shovels and absorbent. Spill area cleaned with detergent and steam cleaners.

Table 3 - Pier 91 Facility: Known Releases to the Environment

UNIT	DATE OF RELEASE	TYPE OF PRODUCT OR WASTE RELEASED (a)	APPROX. QTY/ VOL. RELEASED	MEDIA	NATURE OF RELEASE	HOW RELEASE DETECTED	AGENCY NOTIFIED	MIGRATION PATH	ACTIONS TAKEN
Pier Pipeline System	03-11-78	Bunker C	42 gal	Asphalt paving; possible release to water	Earthquake caused pipeline rupture.	Visual observation.	Unknown	Ruptured pipeline allowed release to asphalt paving near sublease tenant's truck loading/unloading area (west of tank farm wall near tanks 102-104). One gallon travelled to storm drain with connection to Elliott Bay.	Released material was picked up with shovels and absorbent pads. Port of Seattle repaired pipeline and repaved asphalt.
Pier Pipeline System	02-05-79	Bunker oil	50 - 100 gal	Presumably asphalt on Pier.	Overflowing valve pit.	Unknown	Yes, (Ecology)	Released on Pier.	Spill contained on dock.
Pier Pipeline System	02-22-79	Bunker C	100 - 200 gal	Same as above.	Same as above.	Unknown	Yes (Ecology)	Released on Pier.	Spill contained on dock.
Pier Pipeline System	03-22-79	Black oil for fueling purposes, not waste oil.	2,000+	Same as above.	Release caused by failure of tee connection in 16" pier line belonging to Chempro. Accident occurred during off-loading of barge.	Visual observation.	Yes (EPA and Ecology)	Released on Pier.	Chempro clean-up crew and vacuum truck from outside contractor brought in. Approximately 2,000 gallons oil picked up by vacuum truck. Absorbent material spread

Table 3 - Pier 91 Facility: Known Releases to the Environment

UNIT	DATE OF RELEASE	TYPE OF PRODUCT OR WASTE RELEASED (a)	APPROX. QTY/ VOL. RELEASED	MEDIA	NATURE OF RELEASE	HOW RELEASE DETECTED	AGENCY NOTIFIED	MIGRATION PATH	ACTIONS TAKEN
Pier Pipeline System	09-25-85	Waste oil	1 1/2 - 2 gal	Water (and dock)	Leakage of valve pit during dock transfer.	Visual observation of oil sheen on water.	Yes (NRC, USCG)	Release dripped off dock and into water.	Cleaned up with boom, absorbent pads and sorbent material.
Pier Pipeline System	1986	Bunker fuel?	Unknown	Soil and asphalt	Pipeline ruptured due to traffic over paved area.	Unknown	Unknown	Released near truck loading/unloading area (west of tank farm wall near tanks 102-104).	Released material pumped from excavation around pipeline rupture: Port of Seattle replaced damaged piping and repaired asphalt paving.
Pier - Berth F	09-29-78	Diesel	100+ gal	Water (Elliott Bay)	Flange not tightened, valve pit overflowed. Faulty valve allowed pressurization of line with blank flange on it.		Yes (USCG Ecology, Metro)		Cleaned up with boom, absorbent pads, and sorbent material.

(a) All materials released were from waste oil reclamation operations.

APPENDIX D

UNDOCUMENTED POSSIBLE RELEASES TO THE ENVIRONMENT PRIOR TO AND DURING CHEMICAL PROCESSORS, INC. OPERATION

(Chempro 1988)

5.0 UNDOCUMENTED POSSIBLE RELEASES TO THE ENVIRONMENT

5.1 Undocumented Possible Releases to the Environment Prior to Chemical Processors, Inc. Operations

Ground contaminated with what appeared to be gasoline was uncovered in July 1987 during excavation for a new sewer discharge apparatus outside the containment wall near Tank 112. Analytic results from soil samples analyzed for volatile organics using EPA Method 624 showed that the volatile organics present were toluene, ethylbenzene, and xylene, with a total concentration of all materials of approximately 5,500 mg/kg in two of the three samples (see Section 6.0 and Attachment A). These are the primary constituents of gasoline, and the ratios between materials are consistent with gasoline. Gasoline was stored in nearby tanks during earlier periods of facility operations between 1926 and mid-1971. With the exception of a 150-gallon underground gasoline storage tank used in another area of the facility from at least 1971 until removal in 1986, Chemical Processors, Inc. has not stored or processed gasoline since it began operations at the facility in June 1971. The underground gasoline tank used by Chemical Processors, Inc. was removed from an area immediately north of the warehouse (Building 19), decontaminated, certified as cleaned, and scrapped in 1986. Ecology and the Port of Seattle were notified of the results of the July 1987 sampling at the Pier 91 Facility.

Conversations with long-time employees indicate that pits were allegedly dug in the black oil yard (tanks 90 to 92) to contain hoses and other cleanup debris following spills in that area. The pits were covered with planks (approximately 2" x 12"), and then covered with soil to match existing conditions in the rest of the yard. One allegation indicates the pits dated from Navy operations and were discovered during cleanup of the November 1978 oil spill in that area; a second allegation states that a pit was dug in summer 1979 during cleanup of the November 1978 spill to contain cleanup debris from that spill.

Archive drawings of the Pier 91 Facility indicate that the tank bottoms on tanks 96 to 100, 102, and 104 were replaced in the mid-1950s. Tank bottom replacement drawings document the presence of approximately 1 1/2" of oiled sand as an existing foundation under the tanks, with a concrete base of 2 1/2" or more underneath the oiled sand. An additional 4" layer of oil saturated sand was placed under the new tank bottoms at the time of replacement in the mid-1950s. Several archive drawings indicate the oil was probably a hot oil with an asphaltic base, Grade No. 4 or No. 5, and possibly sulphur-free.

5.2 Undocumented Possible Releases to the Environment During Chemical Processors, Inc. Operations

Releases which are undocumented and are not included in Table 2 include occasional releases of oil and oily wastewater during transfer operations between trucks, tanks, rail tankers, and ships. Some of these releases may have reached the soil prior to paving, and may have reached Elliott Bay in cases occurring prior to Chemical Processors, Inc. operations in mid-1971. No documentation of releases to water is available for dates prior to the start of Chemical Processors, Inc. operations. Since the start of Chemical Processors, Inc. operations at the site, contained releases due to operator error are estimated to amount to no more than 3 gallons for each occurrence.

With the exception of concrete bases known to be present under selected tanks, and thought to be present under others, the tank system yards were unpaved until approximately 1982 (small tank yard) and 1986 (marine diesel oil and black oil tank yards). Containment walls appear to have been present from the start, as indicated by archive drawings dating back to 1926. Concrete or asphalt paving in areas outside the tank system containment walls (e.g. pipe alleys, truck loading/unloading areas, and areas adjacent to the warehouse and other buildings) is indicated on archive drawings dating back to 1949. It is not known if paving was present in these areas prior to 1949. Unpaved soil is still evident for approximately 1/2 inch on either side of the railroad tracks along the west side of the warehouse (Building 19), and in an area of approximately 10' x 12' immediately beside the north entrance ramp to the warehouse. It is not known if these factors have contributed to releases to the environment at the facility prior to paving dates indicated above.

Soil piles present in the marine diesel oil (MDO) and black oil yards between 1980 and 1986 may have been left over from cleanup of the 1980 spill in the MDO Yard; they may have also been from subsequent spills and routine cleanup. The soil piles are not thought to date from the 1978 spill; accounts of the 1978 spill cleanup indicate it was completed by early 1980 (rototilled soil, crushed rock, etc. - see Table 2). Results of sampling conducted in July 1986 indicated that the soil was non-hazardous (see Section 6.0 and Attachment A).

Not long after sampling occurred, portions of the soil piles were contained along buttresses on the containment wall and covered with a concrete top. This action was done by PANOCO, the Chemical Processors, Inc. sublease tenant at the site. Oil seeps out on hot days, but is not always evident and is apparently not always seeping. The MDO and black oil yards were paved with concrete by PANOCO in mid to late

1986, at the same time portions of the soil piles along the containment wall were enclosed.

Sometime in 1986, a majority of the soil piles from the MDO and black oil yards were sent to an approved offsite disposal facility. The remaining soil pile(s) in the east end of the MDO Yard (enough to fill about 15 drums) were removed by May 1988. The drums of soil were sent to the Georgetown Facility for disposal as non-hazardous material, based on results of the 1986 sampling and analytical results (see Section 6.0 and Attachment A).

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